GSP INTERNATIONAL AIRPORT

LANDSCAPE MASTER PLAN
APPENDIX 6.8

RECOMMENDED LANDSCAPE MAINTENANCE PRACTICES

NOVEMBER 20, 2015

PREPARED BY

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A current system is in place at GSP for monitoring landscape maintenance practices at the airport. This document is not an attempt to replace the current system of monitoring landscape maintenance, but is meant as a guide for overall GSP landscape maintenance.

SECTION 1: RECOMMENDED WEEKLY MAINTENANCE PRACTICES

1. Irrigation System/Watering:

a) All turf, and ornamental plants shall be watered, as required, to maintain them in a healthy and vigorous condition. On average it is recommended that an application of 1" of water per week be applied to plantings although it is strongly suggested that GSP Maintenance staff determine the evapotranspiration (et) rate, irrigation application depth (+-8" is suggested), rainfall frequency, soil type and characteristics, runoff, and deep percolation below the root zone to predict the amount of water available in the root zone on a given day.

b) With these variables known it then becomes possible to adjust the irrigation system accordingly for seasonal and climatic variations. Adjust the irrigation run times in order to accommodate seasonal and climatic variations. Ensure rain sensors are installed on all systems and in working order

c) Irrigation shall be turned off and winterized each autumn, and turned on again and inspected each spring.

d) Every effort shall be made to run the irrigation systems in the hours between 4 a.m and 11 a.m, to reduce water loss in the hottest part of the day. Avoid irrigating in the evening to prevent the spread of disease.

e) Inspect water pressures on the system monthly and correct any over-or-under pressured systems. The ideal water pressure is 65 P.S.I., except systems operating spray sprinklers and rotator sprinklers, which should operate at 35-40 P.S.I.

f) Maintain the sprinkler system including, lines, heads, valves, timers, nozzles and controls in good operating condition and monitor the system on a regular basis.

g) Should a malfunction be found during the regular monitoring of the system it shall be inspected and repaired within 24 hours.

h) Any repairs to existing systems shall meet the standards for future irrigation, set forth in the landscape master plan.

2. Lawn Areas: Mowing:

a) Mowing shall be conducted at turf areas using a sharp, properly adjusted mower. Mowing shall occur as indicated either once every seven days, once every thirty days, or semi-annually. Trimming/weed-eating (fence lines, trees, mulch rings, and bed lines) shall be done at the same interval

b) Removal of grass clippings should not be necessary if turf is mowed at the proper interval and height. However, anytime clippings are excessive as determined by the Airport, they shall be removed. If mulching mowers are used, turf must be dry at time of mowing. Matted clippings will not be acceptable.

c) All grass clippings shall be blown off of hard surfaces such as parking lots and sidewalks.

d) At no time shall more than 1/3 of the above ground foliage be removed. Mowing should occur per the following schedule, weather permitting, during the growing season to provide a neat and uniform appearance.

Turfgrass / Meadow	Mowing Height (inches)	Frequency of Mowing (days)
Cool-Season		
Ryegrass (overseed established turf areas)	Winter: 1 - 2.5	7 - 10
Fescue	3	7-10
Warm-Season		
Common Bermuda (seeded areas – not irrigated)	2	10 - 14
Hybrid Bermuda (sodded areas - irrigated)	2	5 – 7
Meadow		
Meadow Grasses (existing and overseeded areas – not irrigated)	4 – 6 (Rough-Mow)	Semi Annually

d) Meadow areas shall be mowed with a bush hog at accepted regular intervals as determined by District Staff. (Typically 2-3 times annually)

e) All immovable objects in the lawn area will be trimmed around at the same intervals that the lawn is mowed. Exercise extreme care to assure that trimming does not damage immovable objects whether it be a sign, light fixture, plant material, etc.

f) Signs shall be installed with a stone or concrete base in order to eliminate mowing conflicts. If such a base does not exist, use steel edging to create a clean edge condition.

g) Edge all curbs and sidewalks by the use of a vertical cut machine. The edging shall be done at every mowing during the growing season to maintain a neat appearance. Edging trench will be no wider than one-half (1/2) inch.

h) Litter (debris, trash, twigs, sticks, etc.) shall be picked up prior to mowing. Leaf removal shall occur as necessary during the fall and winter months.

3. Landscape Bed Maintenance:

a) All plant beds shall be maintained weed free. Weeds compete strongly with grass and ornamental plantings for space, water, nutrients, and light and insects can jeopardize to life of the plant. The most effective control is to have a vigorous turf or ornamental planting, one that is properly located, maintained, fertilized and watered. Weeds will be hand pulled in areas where chemical control is hazardous to desired vegetation.

b) Sidewalk cracks shall be sprayed with a post emergent, systemic herbicide such as "Round up" to kill visible weeds.

c) Trash/debris/litter is to be picked up in all maintained areas when observed by landscape maintenance personnel.

4. All shrubs, trees, and ground covers which have sustained structural damage, i.e., broken limbs, stems, etc. shall immediately have the damaged area removed as per the pruning guidelines outlined within the seasonal maintenance procedures. If entire plant is removed, replace in kind of according to the landscape master plan.

5. Pest Maintenance:

a) Maintain recommended maintenance programs for turf. Identify harmful insect populations in the landscape and address these in a proactive / preventative way.

b) A shrub and tree maintenance plan should take into account all methods to control pests including natural forces, host resistance, biological control, mechanical control, cultural controls, and finally pesticide controls. All chemical applications must conform to manufacturer's recommendations applicator must have a current pesticide applications license

6. Landscape lighting:

a) Monitor landscape light fixtures at all monument signage and select landscape areas to ensure light levels are maintained and photocells are operating correctly.

b) Light fixture repair and replacement, if necessary, shall be brought to the attention of GSP Staff.

SECTION 2: RECOMMENDED MONTHLY OR SEASONAL MAINTENANCE PRACTICES

1. Annual Planting Beds:

   a) Will be cultivated and replaced two (2) times a year as indicated on the landscape maintenance program. Plants will be selected based on hardiness and longevity of bloom in addition to attractiveness of blooming mass. The plant selections shall comply with the approved annuals and perennials list. Planting bed soil shall consist of the following materials: 2 part loose peat humus to 1 part sand to 1 part topsoil to 2 part decomposed hardwood mulch analysis commercial fertilizer per 200 cubic feet of planting soil. Annual plantings shall be mulched with finely shredded aged hardwood bark.

2. Soil Testing:

   a) Soil samples from various areas of the property representing both turf and shrub bed plantings should be taken to establish a baseline for PH, soil type, and macro/micro nutrient levels. If the test results show significant nutrient excesses or deficiencies that could be detrimental to tree, shrub or grass health, the soil in the sample areas should be amended as recommended. Areas where soil amendments are required should be tested again after 1 year to insure all elements and PH are within normal ranges. **Soils at various points of the GSP property should be taken in once (1) per year to maintain the healthy growing environments for the GSP landscape.**

3. Fertilization (Trees and Shrubs):

When properly selected and planted, trees and shrubs can be expected to thrive with the right care, which may include watering, fertilizing and pruning. Just as certain established drought-tolerant plants may not require water during dry spells, mature trees and shrubs growing in favorable soil conditions may require little or no fertilizer.

   a) Fertilizer should not be considered a cure for ailing plants when unadapted or unhealthy plants are planted or improperly maintained. Fertilizer is not plant 'food'. Plants make their own food through photosynthesis.

   b) Establish a need for fertilizing by confirming deficiencies with a soil test.

   c) If shrubs or trees are growing in a lawn that is regularly fertilized, there is no need to fertilize them separately. The roots of trees and shrubs will absorb some of the fertilizer applied to the lawn. However, trees and shrubs growing in planting beds may need to be fertilized, especially on sandy soils with little or no organic matter.

d) A complete fertilizer, such as 16-4-8, 12-6-6 or 12-4-8, is generally recommended, unless the soil test reveals that phosphorus and potassium are adequate.

e) Avoid using lawn "weed and feed" fertilizers near trees and shrubs due to the potential for damage.

f) The recommended rates for fertilizing shrubs and trees are based on actual pounds of nitrogen. Shrubs and trees can receive 2 to 4 pounds of actual nitrogen per 1,000 square feet of root spread area per year. The root spread area occupies 1½ times the area of the crown spread (3.14 x radius^2; see Figure 1).

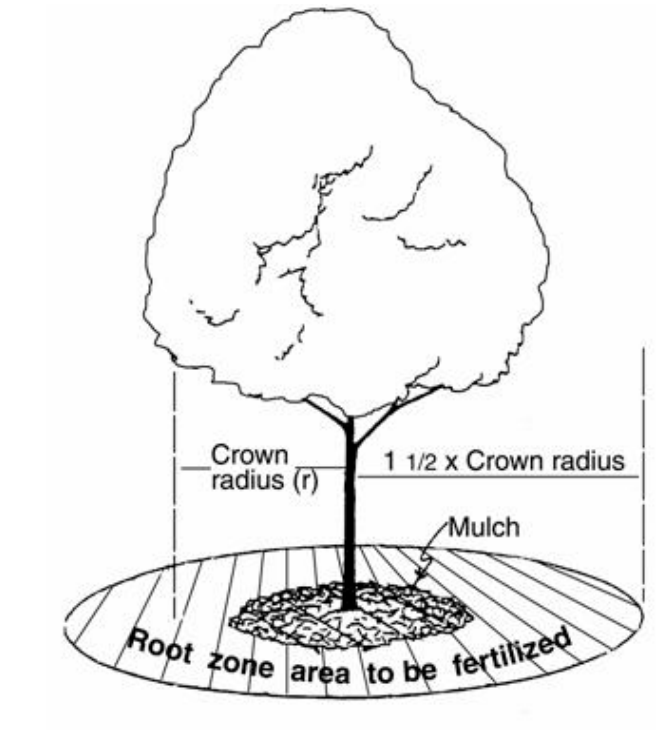


Figure 1. Apply fertilizer evenly on mulched and unmulched surfaces out to about 1½ times the crown radius.

g) Avoid adding too much fertilizer which can harm the plant and the environment. Excessive fertilizer produces rank, weak growth that breaks easily and is susceptible to injury from cold, drought and pests. Also, fertilizer not absorbed by the plant roots may contaminate groundwater and surface water.

h) Exercise great care to prevent fertilizer from spreading to hard surfaces (i.e. pavement and sidewalks). If needed, blow or sweep and remove any fertilizer that is overspread on pavement. This helps to prevent stormwater pollution and fertilizer runoff.

(Above) In addition to creating a waste of product, fertilizer/pesticides that are overspread to hard surfaces create stormwater pollution and should be prevented.

Irrigate soon after you apply fertilizers to wash any fertilizer from the leaves and to help nutrients dissolve and penetrate through the mulch and soil to the roots. Without irrigation or rainfall, some of the nitrogen applied may evaporate and be lost to the atmosphere without benefiting the plants.

i) Trees and shrubs should be fertilized in early spring, and a light fertilizer application can be made in early summer if conditions are conducive to plant growth (that is, reasonable temperatures and soil moisture). Avoid fertilizing trees and shrubs stressed by drought during the summer months. If water is unavailable, do not fertilize at all because plants will be unable to absorb the nutrients.

j) Avoid fertilizing trees and shrubs in the fall months, as this can force tender growth which is damaged by cold weather and freezes.

k) When fertilizing individual shrubs, follow the directions given above for trees. When several shrubs are grouped together in a bed or natural area, however, it is easier to measure the entire area to determine how much fertilizer to apply. Measure the area of the entire bed, making an allowance for the roots that extend beyond the branches of the outermost shrubs. To determine the bed area, use this formula:

- Length x width = root zone area

- Calculate the amount of fertilizer required to apply 2 pounds of nitrogen per 1,000 square feet.

Source: http://www.clemson.edu/extension/hgic

4. Fertilization (Lawns):

Required Elements for Optimum Plant Growth

Macronutrients		Micronutrients
From Air/Water	**From Soil**	**From Soil**
Carbon	Nitrogen	Iron
Hydrogen	Calcium	Copper
Oxygen	Phosphorus	Manganese
	Magnesium	Molybdenum
	Potassium	Zinc
	Sulfur	Boron
		Chlorine

Table 1. Essential Elements Required by Lawn Grasses (From *Southern Lawns*).

a) Establish a need for fertilizing by confirming deficiencies with a soil test. When a soil test of the lawn is not available, Table 2 can be used a guide for lawn fertilization.

b) All fertilizers may burn lawn grasses if improperly applied. Never exceed the recommended rate, or the lawn may be damaged. Always apply fertilizers when temperatures are cool and the grass leaves are *dry* and water thoroughly after application.

Exercise great care to prevent fertilizer from spreading to hard surfaces (i.e. pavement and sidewalks). If needed, blow or sweep and remove any fertilizer that is overspread on pavement. This helps to prevent stormwater pollution and fertilizer runoff.

Lawn grass	J	F	M	A	M	J	J	A	S	O	N	D	Total Yearly N (lbs) per 1000 ft²
Piedmont and Mountain Areas of the Southern United States (See Notes.)													
Bermudagrass	--	--	N*	--	C	N	N	C	--	N*	--	N*	1-4 (1-6 if overseeded)
Tall Fescue	--	C	--	--	--	--	--	--	C	--	C	--	1-3
Zoysiagrass	--	--	N*	--	C	--	N	C	--	--	N*	--	1-3 (1-5 if overseeded)

C = Apply a complete fertilizer (e.g., 16-4-8 or 12-4-8) at 1.0 lb N/1000 sq ft. for high maintenance lawns or ½ lb N/1000 sq.ft. for low maintenance lawns. An additional potassium application at 1 lb K/1000 sq.ft. in late August through mid-September may increase turfgrass winter hardiness.

N = Water-soluble inorganic nitrogen source (e.g., ammonium nitrate or ammonium sulfate) is applied at 1.0 lb N/1000 sq ft. for higher maintenance lawns and ½ lb N/1000 sq.ft. for low maintenance lawns.

Fe = apply iron to provide dark green color without stimulating excessive grass growth. Ferrous sulfate (2 oz in 3-5 gal water per 1000 sq ft) or a chelated iron source may be used when temperatures are #80 F and good soil moisture present.

N* = Overseeded with ryegrass for winter color. Apply ½ pound N per 1000 square feet

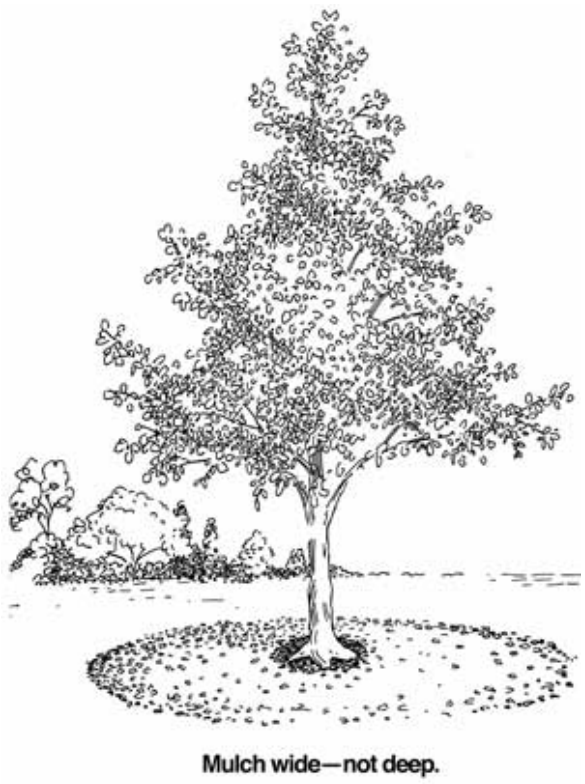
Lawn grass	J	F	M	A	M	J	J	A	S	O	N	D	Total Yearly N (lbs) per 1000 ft²
N+ = to reduce chinch bug problems, use a slow-release N source during the summer. **Notes:** 1. Total yearly nitrogen rates listed per 1000 square feet are suggested guidelines. Actual rates depend on the desire aesthetics and location. Those desiring optimum aesthetics may choose the higher rates. The higher rate range also may be needed for lawns located in sandy soils and/or those with longer growing seasons nearer the coast. 2. Fertilizing centipedegrass in excess of 2 lbs N/1000 sq.ft. per year is not normally recommended as this often results in the disease/winter-kill phenomena termed 'centipedegrass decline' due to excessive thatch. Also, once established, centipedegrass should not receive additional phosphorus fertilizer unless soil tests suggest otherwise. For northern (cooler) portions of each geographical zone listed, fertilize dates may be 1 to 2 weeks later in spring and 1 to 2 weeks earlier in fall; for southern (warmer) regions of each geographical zone listed, fertilizer dates may be 1 to 2 weeks earlier in spring and 1 to 2 weeks later in the fall than listed.												

Table 2. Lawn Fertilization Schedules for Various Turfgrasses and Geographical Areas in the Southern United States (From *Southern Lawns*).

Source: http://www.clemson.edu/extension/hgic

5. Mulch:

a) Mulch shall be double-ground hardwood or hardwood bark. Pine needled may be used in select locations at the discretion of GSP. Re-mulch all planting beds in late winter to maintain a 2-4in depth. In late July, the mulch should be 'turned over' to create a fresh mulch appearance. Open, sunny, and high traffic areas may need to receive additional applications of mulch as necessary to maintain an attractive appearance. When mulching trees and shrubs avoid putting mulch within 6 inches of the plant base or trunk as repeated mulching above the root flare can be detrimental to the plant. Trees in lawn areas should be mulched so that a minimum 6'-0" diameter ring is formed around the trunk. When considering mulch around trees in grassed areas understand that the volume of root growth under mulch is up to 7 times more than roots under grass. Type of mulch is an aesthetic preference – generally a double ground hardwood product is in abundant supply. Note: At no point shall the mulch exceed 5" of depth or touch the trunk of trees.



(Above) When mulching trees, the area covered is much more important than the depth of the mulch. Note the exposed trunk flare. Do not allow mulch depth to exceed 5" or be applied to the trunk flare at any time.

6. Lawn Renovation:

a) Mechanical Aeration for fescue lawns should be performed during the early Fall. (Bermuda Lawns shall be mechanically core aerated in Late Spring) To be most effective, coring should be done deep as possible. When aerifying, the soil should be moist but not wet for best results. Lightly wetting the turf before aerifying will help lubricate the aerator tubes to help keep the soil moving through them. When the soil is good quality (sand, loamy sand, or sandy loam), then the cores can be broken up with a fixed knife verti-cut mower, a weighted section of chain link fence, or a metal doormat. If the cores are not too wet or dry, they will normally

break up fairly easily. Getting the soil from the cores below the turf canopy helps to form and smooth the soil surface. Fertilization after aerification speeds grass growth to cover holes visible in the turf or soil remaining after coring.

7. Pruning of Trees and Shrubs:

   a) Pruning is to enhance the plant's natural shape and beauty as well as for structure and safety. Plant growth should be kept clear of walkways, buildings, and curbs and to prevent any potentially dangerous situations. Pruning should be carried out by trained employees. All pruning of trees should conform to ANSI A-300 Pruning Standards and pruning of shrubs and groundcovers should be in accordance with accepted horticultural standards as practiced by the American Nurseryman's Association. Types of pruning and the time of year to perform this work is determined by the plant species. The following is a guide to pruning times:

   b) Trees and shrubs that flower before the first of June should be cut back or pruned immediately after flowering.

   c) Trees or shrubs that flower after the first of June should be pruned in the late winter or early spring before new growth starts.

   d) Evergreen shrubs both broad leafed and narrow leafed types can be lightly pruned anytime to maintain their shape but heavy pruning should be done in late Winter or early Spring before new growth begins.

   e) Prune out any dead, injured, or diseased branches as soon as identified, no matter what the season.

8. Pruning Methods: The following is a brief explanation of pruning types:

   a) *Crown Cleaning* – Crown cleaning shall consist of the selective removal of one or more of the following items: dead, dying, diseased, weak branches and water sprouts from a tree's crown.

   b) *Crown Thinning* – Crown thinning shall consist of the selective removal of dead and live branches to help increase light penetration, air movement, and reduce overall weight. No more than 25% of live canopy should be removed within one growing season. Note: the practice of removing only interior branches or "lion's tailing" shall be avoided.

   c) *Crown Raising* – Crown raising shall consist of the removal of lower branches of a tree in order to provide vertical clearance. Amount of clearance should be specified.

   d) *Crown Reduction* – Crown reduction reduces the overall height and or spread of a tree. Consideration shall be given to whether the tree species can withstand this type of pruning.

   e) *Crown Restoration* – Crown restoration shall consist of selective pruning to improve the structure, form, and appearance of trees that have been previously damaged by topping, storms and or vandalism.

   f) *Structural Pruning* – Structural pruning is the removal of live branches and stems to influence the orientation, spacing, growth rate, strength of attachment, and ultimate size of branches and stems.

g) *Pollarding* – Pollarding is a training system that involves heading the first year followed by annual sprout removal to maintain trees or shrubs at a predetermined size or to maintain a "formal" appearance.

9. Pruning Specimen Shrubs:

a) Remove all dead, broken, diseased, or insect-damaged branches. Dip pruning shears and wash in a weak rubbing alcohol (70% isopropyl alcohol) or chlorine bleach solution (1 part to 9 parts water) to prevent spreading disease between plants.

b) Remove branches that cross each other and errant branches that may skew shrub shape.

c) Remove vigorous shoots coming from the base and outgrowing the general outline of the shrub. Cut back some of the largest and oldest branches at the base. Before making cuts, imagine what the plant would look like with the branch removed.

d) Slow growing shrubs should seldom be headed back and never sheared. It's important to maintain their natural shape by thinning out branches and cutting others back to a bud or a side shoot to direct future growth. On vigorous mature shrubs, remove 1/3 of the older branches each year to continually renew the plant. Shorten younger, smaller branches to maintain the desired size or shape. Do not use hedge shears but cut each branch separately to different lengths with hand pruners. By changing the depths of those cut, the shrub will take on a textured, natural look. A properly pruned shrub doesn't look as if it has been pruned. Pruning cuts should not be visible but located inside the plant, covered up by remaining foliage. All hand-pruning tools must use a bypass cutting action.

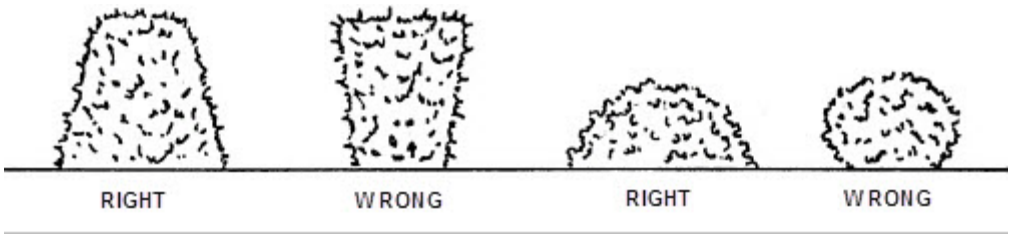
10. Pruning Hedges:

a) The method of pruning hedges depends on the type of hedge desired. Informal hedges generally consist of a row of closely planted shrubs, which are allowed to develop into their natural shape. Annual pruning consists of thinning and heading back just enough to maintain desired height and width. Formal or clipped hedges require a specialized pruning, which may become a continuous job during the growing season. The desired appearance of a formal hedge is a soft outline of foliage from the top of the hedge to the ground. Unless otherwise indicated all shrubs will be allowed to grow together into a uniform mass with just a hint of individual plants, not as balls or individual objects.

b) Two important factors to remember when pruning formal hedges are:

1) Clip hedges while the new growth is green and succulent and

2) Trim plants so the base of the hedge is wider than the top. Hedges pruned with a narrow base will lose their lower leaves and branches because of insufficient light. This condition will worsen with age, resulting in sparse growth at ground level and an unattractive hedge, which does not give desired privacy. Flowering hedges grown formally should be sheared after they have bloomed since more frequent shearing reduces the number of blooms. If the blooms are not important, pruning may be conducted at any time.

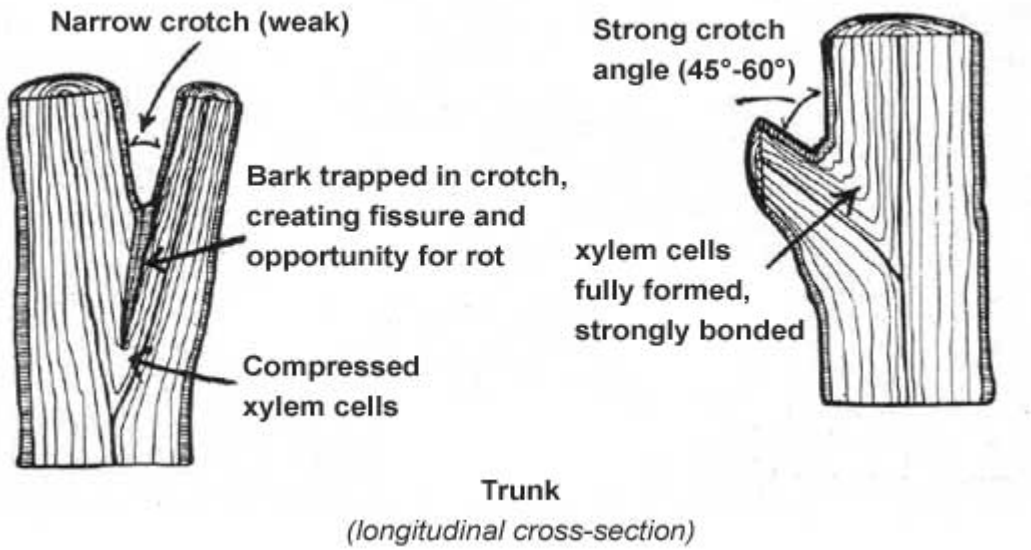


(Above) Proper pruning of hedges to allow sunlight to base. Courtesy landscapeadvisor.com

11. Structural Pruning of Young Trees:

a) Trees require attention during the first several years of growth to develop strong, well-spaced main branches. During their first year in the landscape, remove dead, broken, or diseased limbs.

b) Young trees should be pruned to a single leader to develop a good structure for future growth. Decurrent trees will generally develop multiple large co-dominant branches to form a broad canopy while excurrent trees can be pruned to maintain a single main trunk to its highest point. Structural pruning to maintain a central leader should be done as long as it is practical to do so recognizing that as a tree ages its natural form must be allowed to develop. Structural pruning should **allow minimal branching at attachment angles less than 60 degrees** (no narrow forks or branches leaving the trunk at a sharp angle. Branch angles should be greater than 10 or 2 o'clock to prevent splitting). As the tree gets older, become familiar with its natural form and strive to retain the natural growth of the tree. Choose the best spaced and positioned permanent branches and remove or reduce others.



(Above) Strong branch attachments (usually at an angle greater than 60 degrees to the trunk versus weak narrow branch attachments.

c) Permanent branches should be spaced between 6 and 24 inches apart on the trunk, depending on the mature size of the tree or 6inches for every 10ft of mature tree height. After strong main branches have been established, very little pruning is required during most of the life of deciduous trees. Continue to remove dead, damaged branches, including those which cross or grow close together as needed. Remove water sprouts along the main trunk or at the base of the trunk and fast-growing whips which grow out of the crown on many young tree species.

See Crown Correction Detail for example of correct structural pruning of young trees.

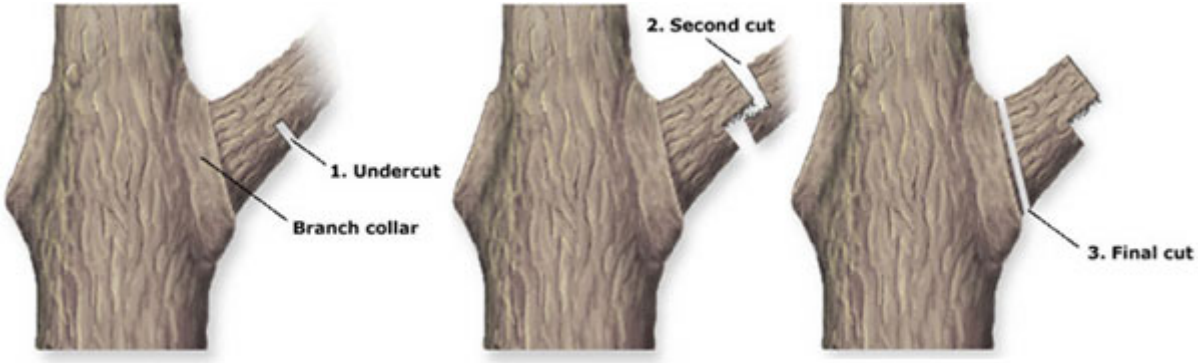
12. Pruning Cuts on Trees:

a) The location and size of the cut influences the length of time required for the wound to seal over. Make **cuts close to but outside of the branch bark ridge and the branch collar** at the base of a branch. Branch bark ridges are areas, rings, or lines of bulging bark

which may be rougher and darker in color than surrounding bark. The collar is a swollen area at the base of a branch. This region between the branch and the trunk acts as a natural barrier to decay-causing organisms. This protective zone **should NOT be removed or damaged** since wood decay organisms can invade the trunk and cause a serious trunk wound. Again, **final flush cuts to the trunk should NOT be made.** (Reference pruning sequence diagram)

b) Removing Large Branches: If at all possible, removal of large branches (8" in diameter and up) shall be avoided. Proper structural pruning on young trees eliminates the need for large branch removal. However, if a large branch must be removed, follow the guidelines below:

Large branches which are too heavy to be held with the hand (12 inches or larger in diameter) require 3 separate cuts to prevent the bark from stripping. The first cut is made on the lower side of the branch about 1 to 2 feet away from where the final cut will be. Make the cut as far up as possible before the weight of the branch binds the saw. The second cut is made downward from the top of the branch within 1 to 2 inches of the first cut. Saw until the limb breaks off in your hand while cutting it from the tree. This cut should begin on the outside of the branch bark ridge and collar and end just outside of the swelling on the lower side of the branch. The final cut can then be made, with care to stay out of the branch collar.



(Above) Proper pruning sequence for tree limbs. The undercut prevents tearing of the bark when the limb is cut. Note that the branch collar is intact, and is not cut flush to the trunk. This allows the tree to heal the cut properly.

Courtesy forestkeepers.net

c) Crape myrtles will be pruned to allow for the natural development as small accent trees. Remove sprout growth in the lower half to 2/3 of the tree and dead wood as needed and crown thin the upper canopy as needed - about once every 2 years. Crown reduce myrtles only as needed to prevent stem failure. At no point should crape myrtles be topped, or "crape murdered", as this is detrimental to both the aesthetics and health of the tree.

SECTION 3: MAINTENANCE OF THE GSP STREET BUFFERS (EXISTING FOREST)

1) The Turf Shoulder:
    a. This area shall be maintained as a turf area, mown weekly during the growing season, and bi-weekly during the offseason.
    b. Street trees shall be mulched according to the details in the maintenance guidelines.
    c. Prune street trees to maintain a healthy structure. Prune according to the maintenance guidelines, and according to the accepted best management practices.
    d. Maintain irrigation in this area. Irrigation system to be checked monthly during the growing season, and bi-monthly during the winter.
2) The Underbrushed Forest:
    a. The intent of this area is to be a maintained, mature forest canopy with a managed understory.
    b. This area shall be sprayed with herbicide (such as round-up) twice annually to control herbaceous weeds and underbrush.
    c. Fallen limbs/and or fallen trees shall be removed in this area monthly.
    d. Any dead or hazard trees shall be removed, taking care to not damage surrounding vegetation.
    e. Invasive species shall be removed. Trees may be removed as needed to manage pest outbreaks.
3) The Natural Forest:
    a. The intent of this area is to be a natural forest, requiring little to no maintenance.
    b. This area shall be maintained as-is. Vegetation shall only be removed to manage invasive species and pest outbreaks.
    c. Fallen trees shall not be removed from this area unless they present an immediate threat to surrounding property. If no threat exists, trees should be allowed to decay naturally.
    d. In the event that vegetation is removed in this area, the area shall be replanted to match the density of surrounding natural forest areas. A diversity of canopy trees and native ornamental trees shall be used.

4) The Transition:

   a. The intent of this area is to provide some relief between the dense natural forest and developed parcels.

   b. This area shall be seeded with native grasses, and rough-mown (bush-hogged) two or three times annually.

SECTION 4: ESTABLISHMENT OF THE GSP STREET BUFFERS (NO TREES EXISTING)

1) The Turf Shoulder:
   a. Install irrigation in this area per the irrigation guidelines set forth in the Landscape Master Plan.
   b. Street trees shall be planted in this area, 40' O.C., in accordance to the street tree section of the Landscape Master Plan. Utilize the street sections to ensure the correct placement and planting distances from the back of curb/edge of sidewalk.
   c. Note: Where sidewalks are proposed, the street tree shall be in the turf area between the sidewalk and curb, and the Underbrushed forest area shall begin 10' from the back edge of the sidewalk.
2) The Underbrushed Forest:
   a. Remove all invasive species from this area.
   b. Plant a variety of canopy trees from the approved plant list provided as part of the landscape master plan.
   c. Mix hardwood (deciduous) and evergreen trees in an approximately 50/50% mixture.
   d. Canopy trees in this area shall be planted in naturalistic groupings, with no more than 20' between trees.
   e. Understory trees from the approved plant list shall be planted at the ratio of five (5) understory trees per 100 linear feet of road frontage. These shall be planted at varying depths within the buffer in naturalistic groupings.
   f. Mulch using leaf litter or wood chips. As forest matures, maintain a natural leaf litter mulch
   g. For one year after planting, use water trucks to water these trees regularly and establish the plantings.
3) The Natural Forest:
   a. Remove all invasive species in this area. Selective hardwoods and evergreens may be left and planted around if desired.
   b. Plant a variety of canopy trees from the approved plant list provided as part of the landscape master plan.
   c. Mix hardwood (deciduous) and evergreen trees in an approximately 30% hardwood/70% evergreen mixture.
   d. Canopy trees in this area shall be planted in naturalistic groupings, with no more than 20' between trees.
   e. Mulch using leaf litter or wood chips. As forest matures, maintain a natural leaf litter mulch

f. If larger material is planted (over 1" caliper or 4' Height, use water trucks regularly for one (1) year to ensure establishment of the forested area.

g. For a period of two (2) years after planting, remove any invasive species and herbaceous plants twice annually in the spring and fall to ensure proper tree growth. Take care to not damage planted trees.

h. Mulch using leaf litter or wood chips. As forest matures, maintain a natural leaf litter mulch.

4) The Transition:

a. Loosen the soil surface before broadcasting the seed. Apply seed evenly by the most convenient method available for the type of seed used and the location of the temporary seeding. Typical application methods include but are not limited to cyclone seeders, rotary spreaders, drop spreaders, broadcast spreaders, hand spreaders, cultipacker seeder, and hydro-seeders. Cover applied seed by raking or dragging a chain, and then lightly firm the area with a roller or cultipacker.

b. Seed mixes can be a native grass meadow mixture containing species proven for the conditions of the site, or mixes acceptable to SCDHEC. (see chart below)

Permanent Seeding - Upstate

Species	Lbs/Ac	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Bahia Grass (Alone)	40												
Bahia Grass (Mix)	30												
Bermuda Grass (hulled) (Alone)	8-12												
Bermuda Grass (hulled) (Mix)	4-6												
Fescue, Tall (KY31) Alone	40												
Fescue, Tall (KY31) mix	20												
Sericea Lespedeza (Scarified) Alone or Mix (inoculate with EL Innoculant	40												
Ladino Clover (mix only) Innoculate with AB Innoculant	2												
For Steep Slopes/Cut Slopes													
Weeping Lovegrass (Alone)	4												
Weeping Lovegrass (Mix)	2												
Crownvetch (Mix) (Inoculate with Type M Innoculant	8-10												

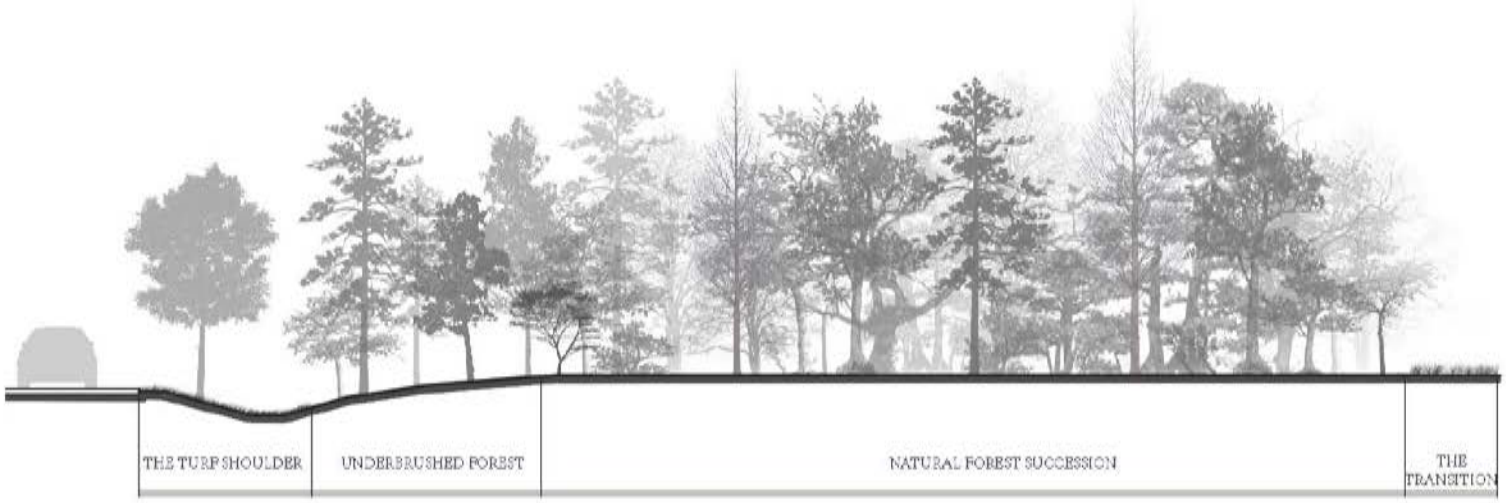
c. Native grass mixes are available commercially and are preferable to straight grass mixtures. (Examples below)

Tall Grass Prairie Mix

Mesic Short Grass Prairie Mix

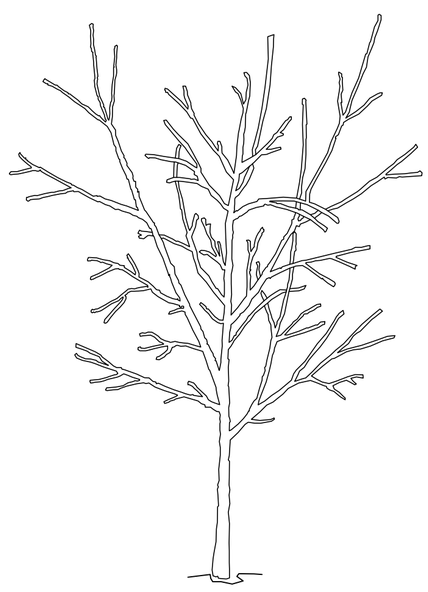
d. Ensure adequate coverage at two months post-seeding, and if large bare areas exists, reseed these areas with the same mixture.

e. Mow three (3) times annually in spring, summer, and fall to ensure establishment of a meadow grass strip.


THE TURF SHOULDER
UNDERBRUSHED FOREST
NATURAL FOREST SUCCESSION
THE TRANSITION

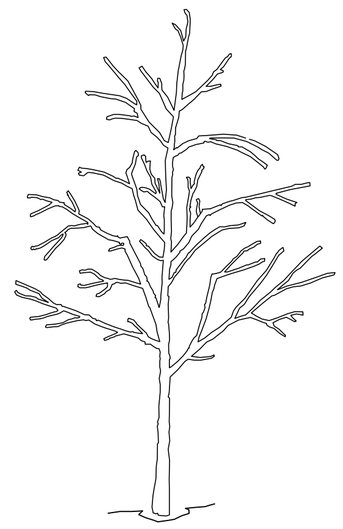
SECTION 3: RECOMMENDED PLANTING AND PRUNING DETAILS

The details on the following pages should be adopted as standards for GSP landscape maintenance staff. This detail section may be added to as necessary pending review from GSP staff.



Before planting, tree has three codominant stems. The two that compete with the one in the center should be pruned to supress their growth.

Two competing stems were reduced substantially, in this case remvoing about 70% of their foilage using reduction cuts.

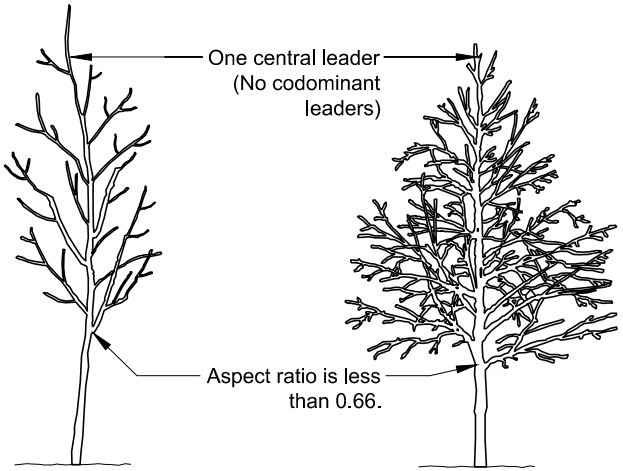


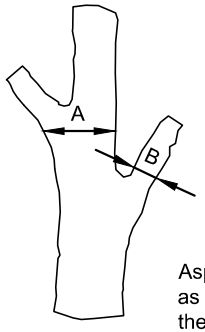
After pruning, tree has only one dominant stem.

Notes:
1- All trees shown are rejectable unless they undergo recommended treatment.
2- Tree shall meet crown observation detail following correction.

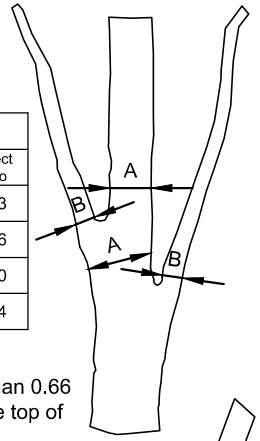
CROWN CORRECTION DETAIL

ACCEPTABLE



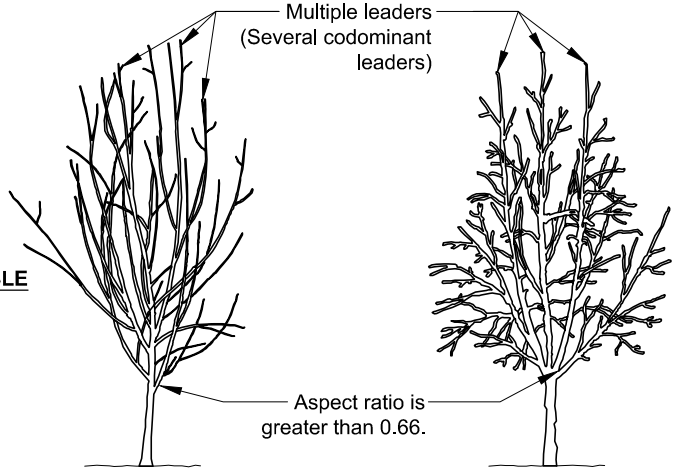


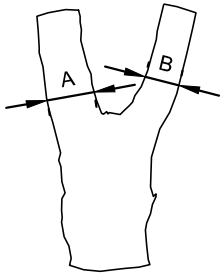
Example		
A	B	Aspect Ratio
1.50"	0.50"	0.33
2.50"	0.90"	0.36
2.0"	1.00"	0.50
2.50"	1.60"	0.64



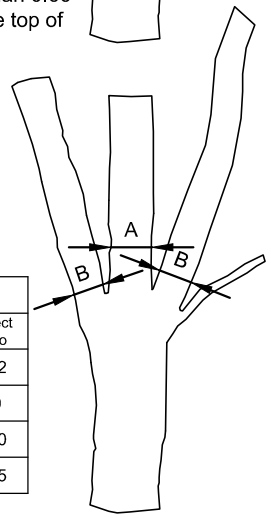
Aspect ratio of B:A less than 0.66 as measured 1" above the top of the branch union.

REJECTABLE





Example		
A	B	Aspect Ratio
2.50"	1.80"	0.72
2.0"	2.0"	1.0
2.50"	2.0"	0.80
4.0"	3.0"	0.75



Aspect ratio of B:A greater than or equal to 0.66 as measured 1" above the top of the branch union.

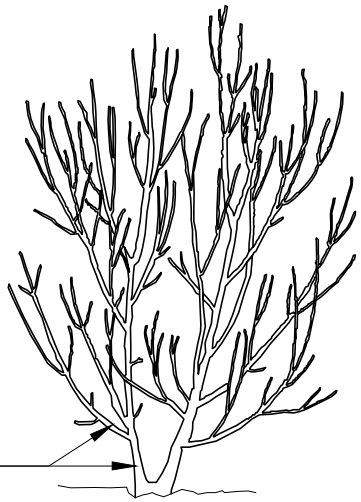
Notes:

1- Aspect ratio shall be less than 0.66 on all branch unions. Aspect ratio is the diameter of branch (B) divided by the diameter of the trunk (A) as measured 1" above the top of the branch union.

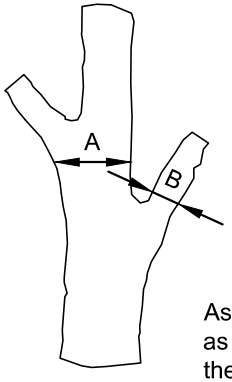
2- Any tree not meeting the crown observations detail may be rejected.

CROWN OBSERVATIONS - HIGH BRANCHED

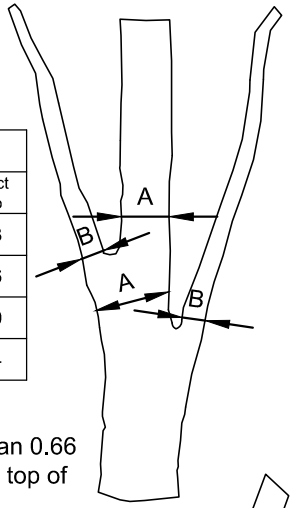
ACCEPTABLE



Aspect ratio is less than 0.66.



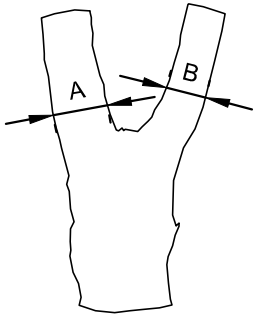
Example		
A	B	Aspect Ratio
1.50"	0.50"	0.33
2.50"	0.90"	0.36
2.0"	1.00"	0.50
2.50"	1.60"	0.64



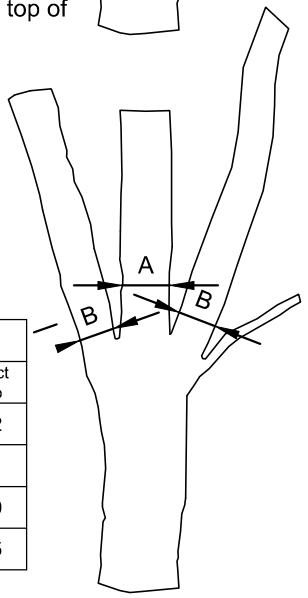
Aspect ratio of B:A less than 0.66 as measured 1" above the top of the branch union.

REJECTABLE

Aspect ratio is greater than 0.66.



Example		
A	B	Aspect Ratio
2.50"	1.80"	0.72
2.0"	2.0"	1.0
2.50"	2.0"	0.80
4.0"	3.0"	0.75



Aspect ratio of B:A greater than or equal to 0.66 as measured 1" above the top of the branch union.

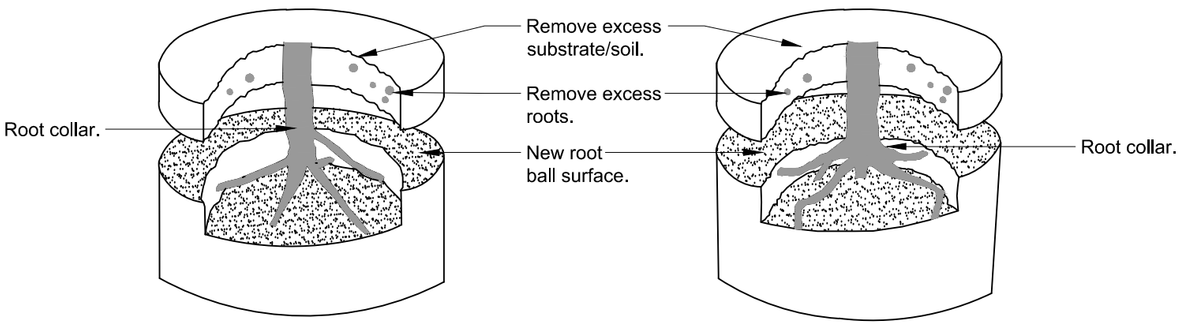
Notes:

1- Aspect ratio shall be less than 0.66 on all branch unions. Aspect ratio is the diameter of branch (B) divided by the diameter of the trunk (A) as measured 1" above the top of the branch union.

2- Any tree not meeting the crown observations detail may be rejected.

CROWN OBSERVATION DETAIL - MULTI

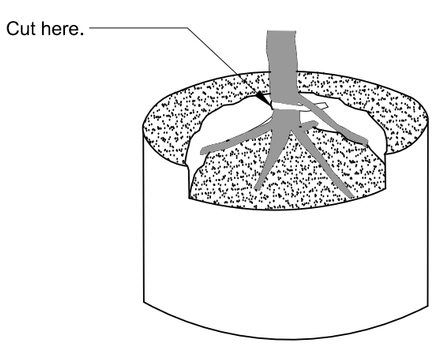
Step 1 - Remove substrate over root collar.



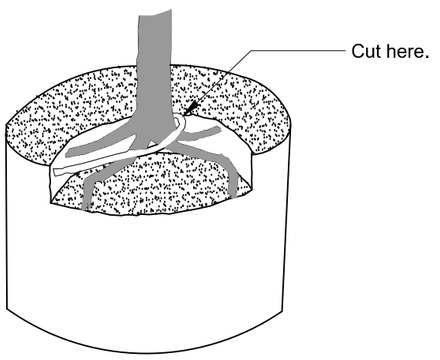
Tree planted too deeply in root ball. Remove excess substrate and roots to meet root inspection detail.

Tree planted too deeply in root ball. Remove excess substrate and roots to meet root inspection detail.

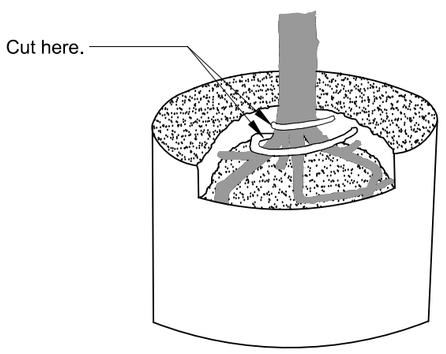
Step 2 - Remove defects.



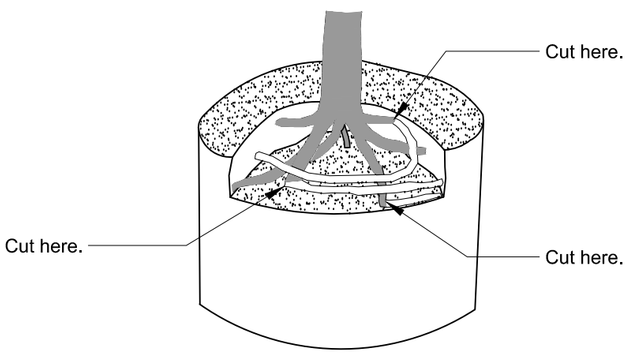
Five structural (large) roots shown in black. Remove structural root (white) wrapping root collar.



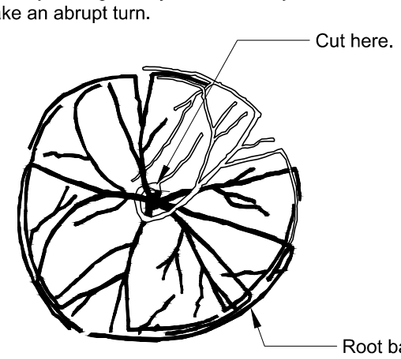
Four structural roots shown in black. Remove root (white) growing over structural roots.



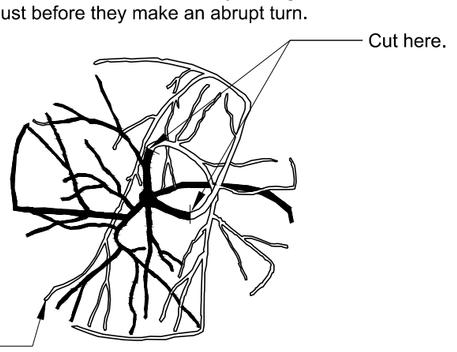
Six structural roots shown in black. Remove roots (white) growing over root collar by cutting them just before they make an abrupt turn.



Seven structural roots shown in black. Remove structural roots (white) growing around or over root collar by cutting them just before they make an abrupt turn.



Cut structural root just before it makes abrupt turn. Pruning cut should be made tangent (parallel) to the trunk.



Cut structural roots just before they make abrupt turn by cutting tangent (parallel) to the trunk (two cuts shown).

Notes:

1- All trees shown are rejectable unless they undergo recommended correction.

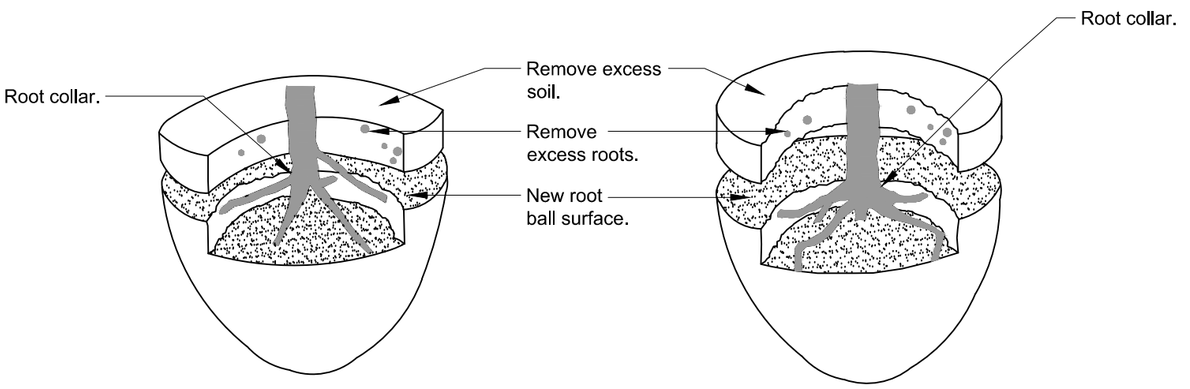
2- First Step 1, then Step 2. Roots and soil may be removed during the correction process; substrate/soil shall be replaced after correction has been completed.

3- Trees shall meet root observations detail following correction.

4- Small roots (1/4" or less) on the periphery of the root ball are common with container plant production. These small roots are not defined as "defects" and can be addressed at the time of installation (See root ball shaving container detail).

ROOT CORRECTION DETAIL - CONTAINER

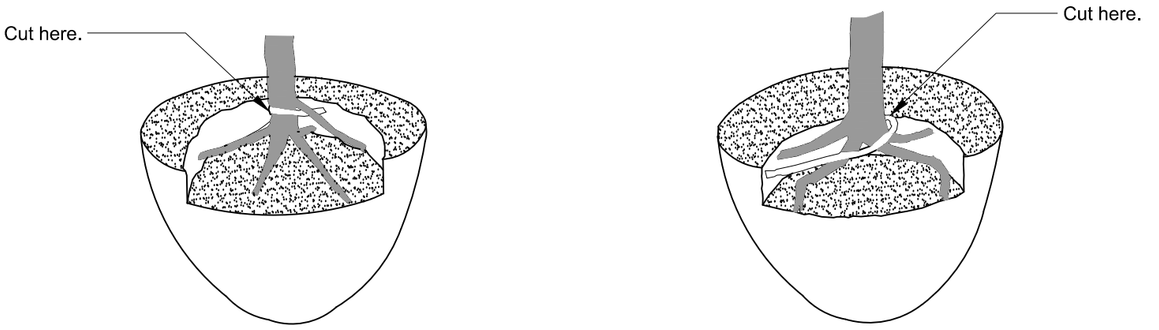
Step 1 - Remove soil and roots over the root collar.



Tree planted too deeply in root ball. Remove excess soil and roots to meet root inspection detail.

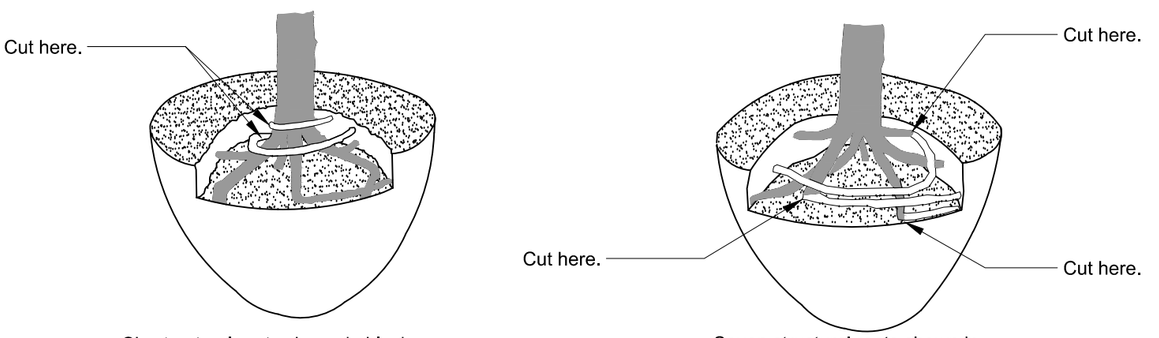
Tree planted too deeply in root ball. Remove excess soil and roots to meet root inspection detail.

Step 2 - Remove defects.



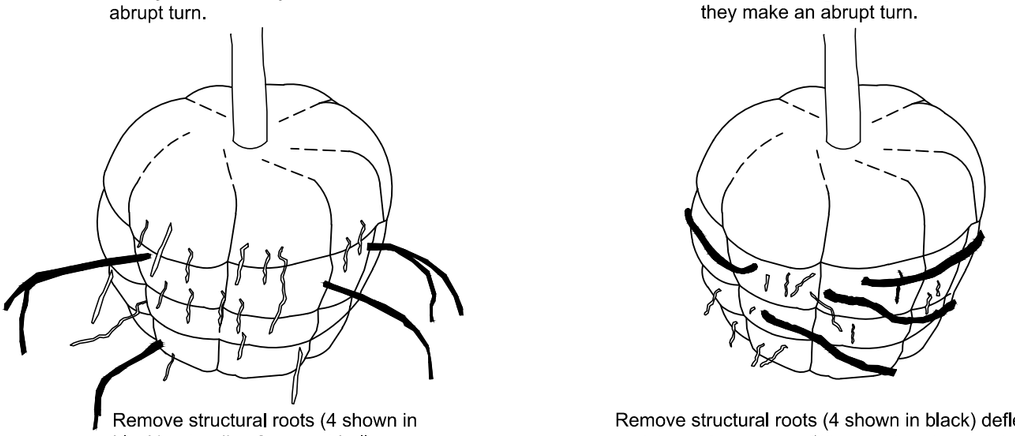
Five structural (large) roots shown in black. Remove structural (white) root wrapping root collar.

Four structural roots shown in black. Remove root (white) growing over structural roots.



Six structural roots shown in black. Remove structural roots (white) growing over root collar by cutting them just before they make an abrupt turn.

Seven structural roots shown in black. Remove structural roots (white) growing around or over root collar by cutting them just before they make an abrupt turn.



Remove structural roots (4 shown in black) extending from root ball.

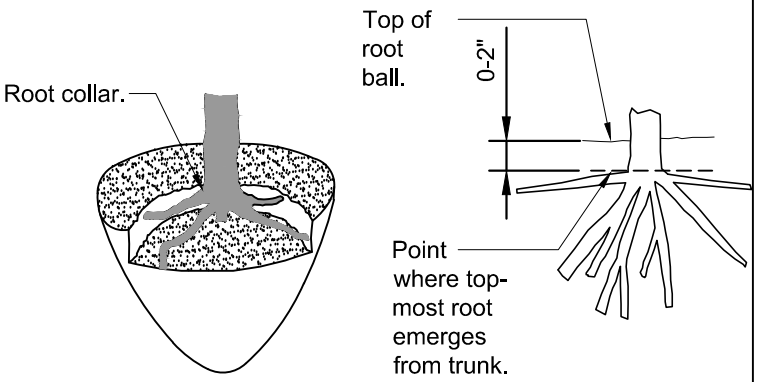
Remove structural roots (4 shown in black) deflected on root ball periphery. Small roots (¼" or less) at the periphery of the root ball are not defined as defects and do not need to be removed.

Notes:

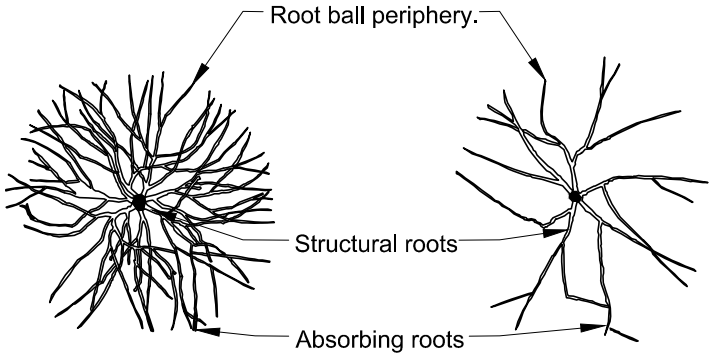
1- All trees shown are rejectable unless they undergo recommended correction.
2- First step 1, then step 2. Adjust hole depth to allow for the removal of excess soil and roots over the root collar.
3- Roots and soil may be removed during the correction process; substrate/soil shall be replaced after the correction has been completed.
4- Trees shall pass root observations detail following correction.

ROOT CORRECTION DETAIL - BALLED AND BURLAPPED

ACCEPTABLE

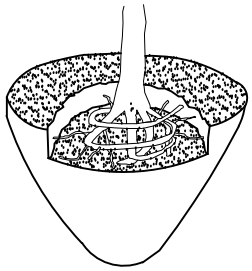


The point where top-most root(s) emerges from the trunk (root collar) should be within the top 2" of substrate. The root collar and the root ball interior should be free of defects including circling, kinked, ascending, and stem girdling roots. Structural roots shall reach the periphery near the top of the root ball.

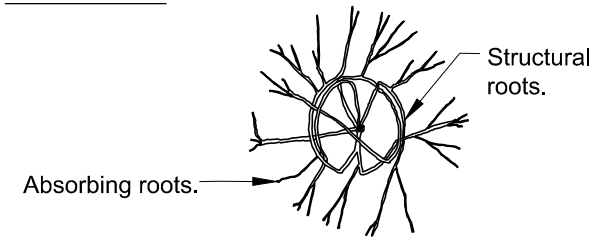


Roots radiate from trunk and reach side of root ball without defecting down or around.

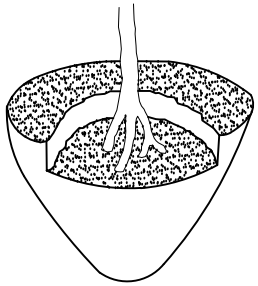
REJECTABLE



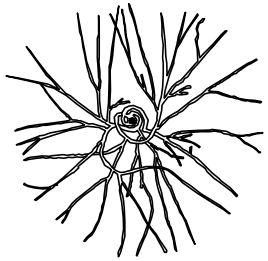
Structural roots circle interior of root ball. No structural roots are horizontal and reach the root ball periphery near the top of the root ball.



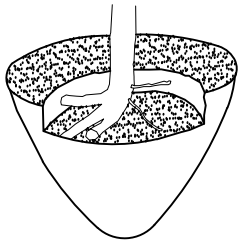
Only absorbing roots reach the periphery near the top of the root ball. Structural roots mostly wrap or are deflected on the root ball interior.



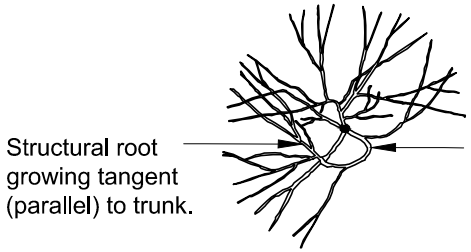
Structural roots descend into root ball interior. No structural roots are horizontal and reach the root ball periphery near the top of the root ball.



Structural roots circle and do not radiate from the trunk.



Structural roots primarily grow to one side.



Structural roots missing from one side, and/or grow tangent to trunk.

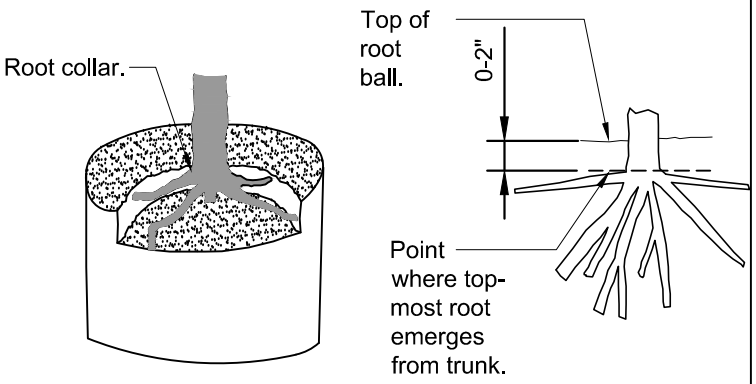
Notes:

1- Observations of roots shall occur prior to acceptance. Roots and soil may be removed during the observation process; substrate/soil shall be replaced after the observations have been completed.

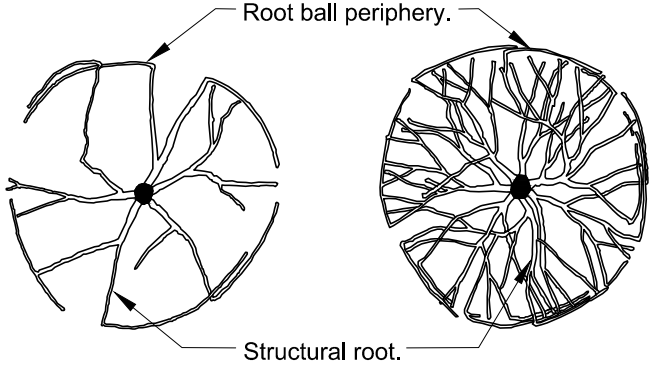
2- See specifications for observation process and requirements.

ROOT OBSERVATIONS DETAIL - BALLED AND BURLAPPED

ACCEPTABLE

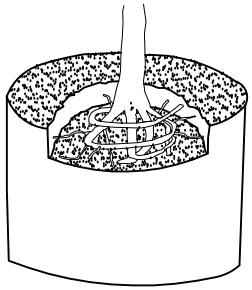


The point where top-most root(s) emerges from the trunk (root collar) should be within the top 2" of substrate. The root collar and the root ball interior should be free of defects including circling, kinked, ascending, and stem girdling roots. Structural roots shall reach the periphery near the top of the root ball.

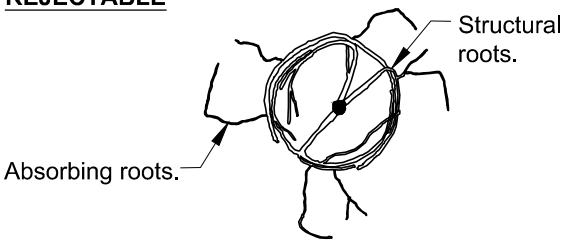


Roots radiate from trunk and reach side of root ball without deflecting down or around.

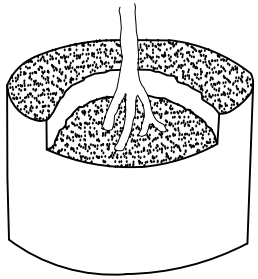
REJECTABLE



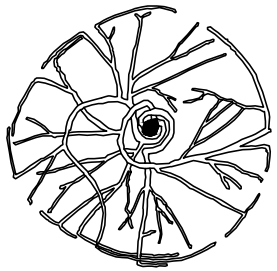
Structural roots circle interior of root ball. No structural roots are horizontal and reach the root ball periphery near the top of the root ball.



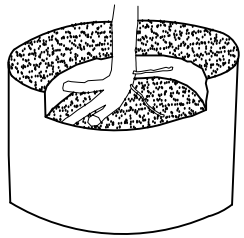
Only absorbing roots reach the periphery near the top of the root ball. Structural roots mostly wrap or are deflected on the root ball interior.



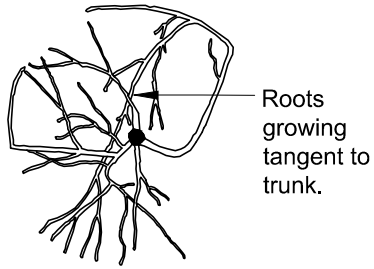
Structural roots descend into root ball interior. No structural roots are horizontal and reach the root ball periphery near the top of the root ball.



Structural roots circle and do not radiate from the trunk.



Structural roots primarily grow to one side.



Structural roots missing from one side, and/or grow tangent to trunk.

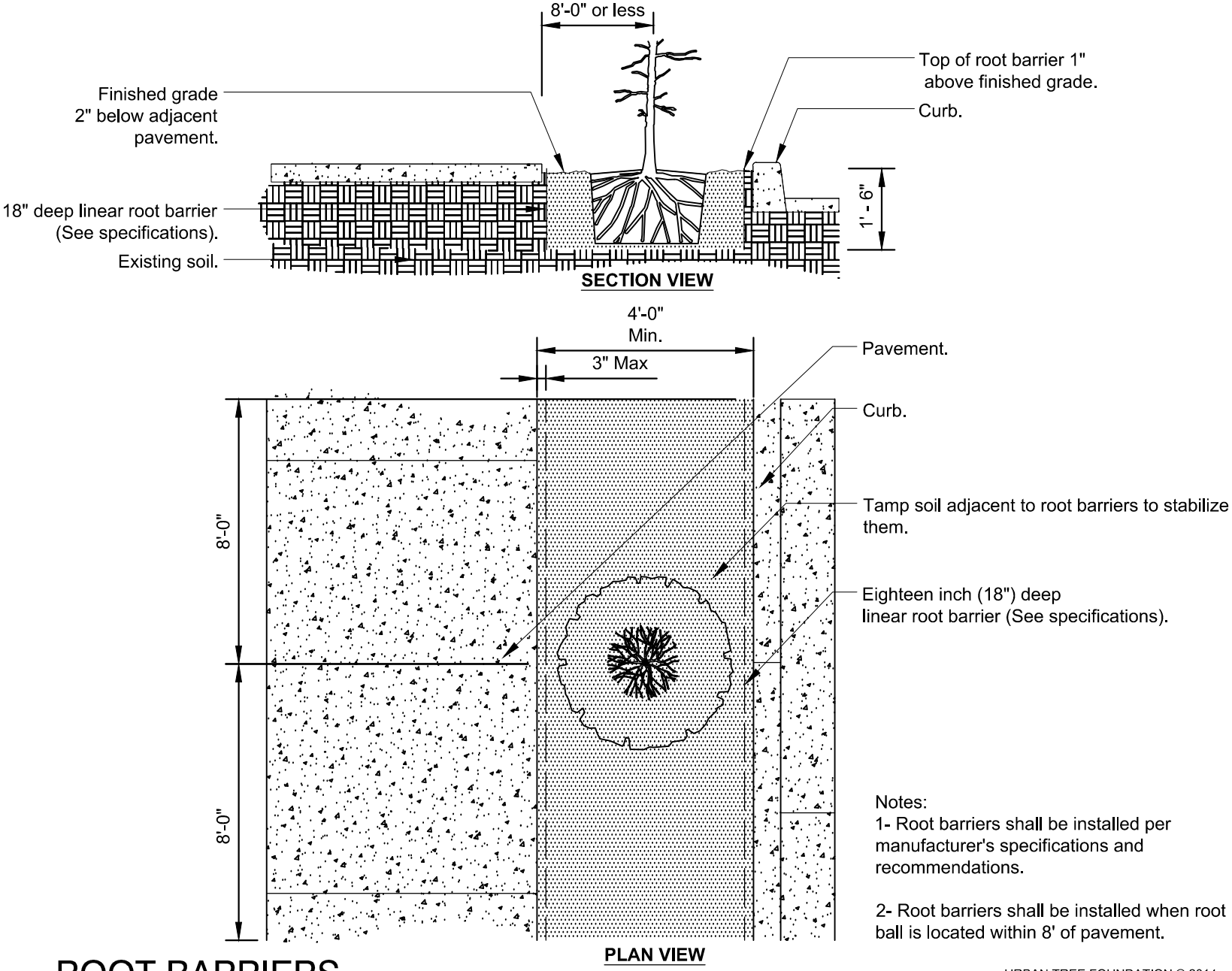
Notes:

1- Observations of roots shall occur prior to acceptance. Roots and substrate may be removed during the observation process; substrate/soil shall be replaced after observation has been completed.

2- Small roots (¼" or less) that grow around, up, or down the root ball periphery are considered a normal condition in container production and are acceptable however they should be eliminated at the time of planting. Roots on the periperhy can be removed at the time of planting. (See root ball shaving container detail).

3- See specifications for observation process and requirements.

ROOT OBSERVATIONS DETAIL - CONTAINER



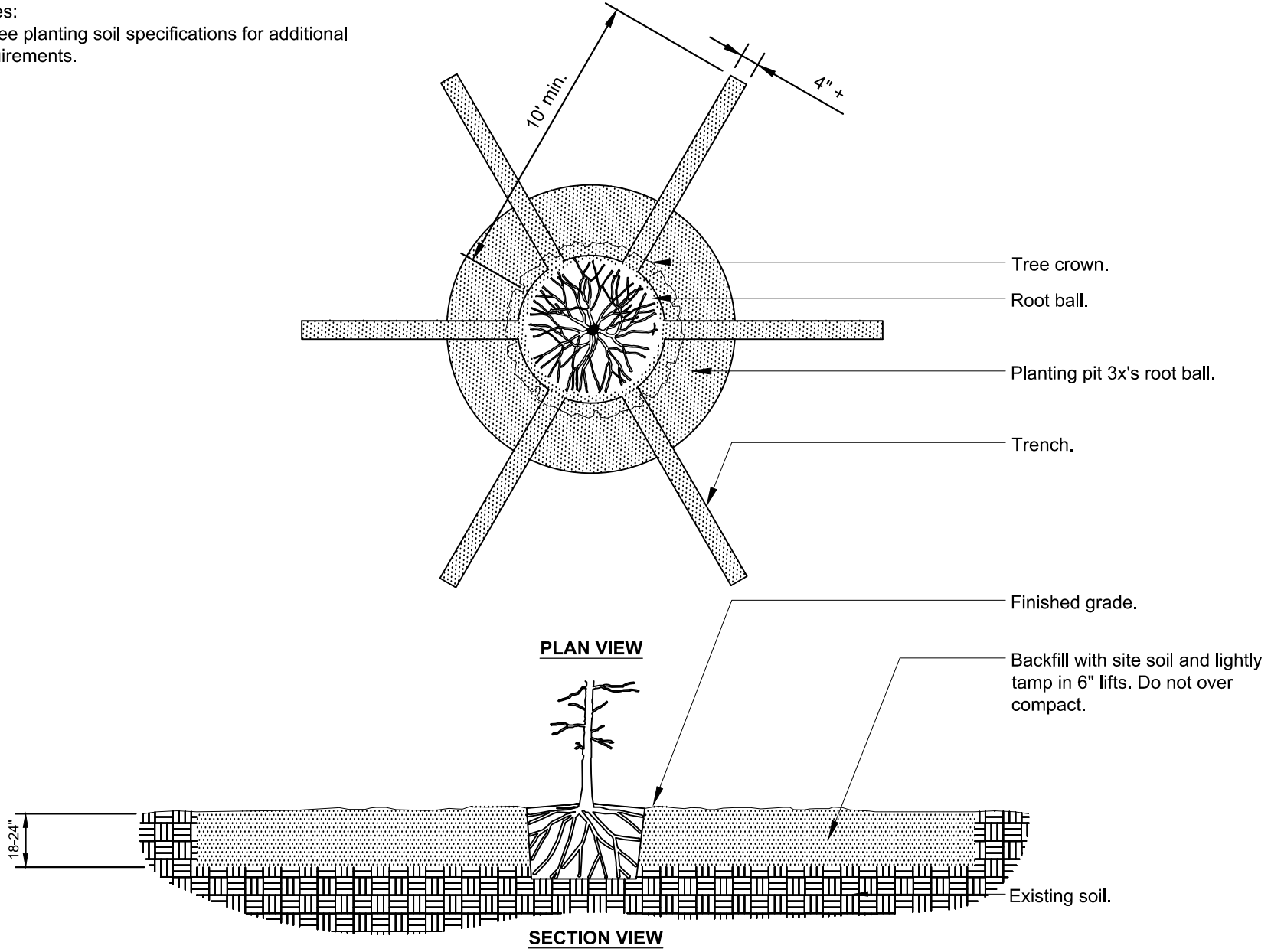
ROOT BARRIERS

Notes:

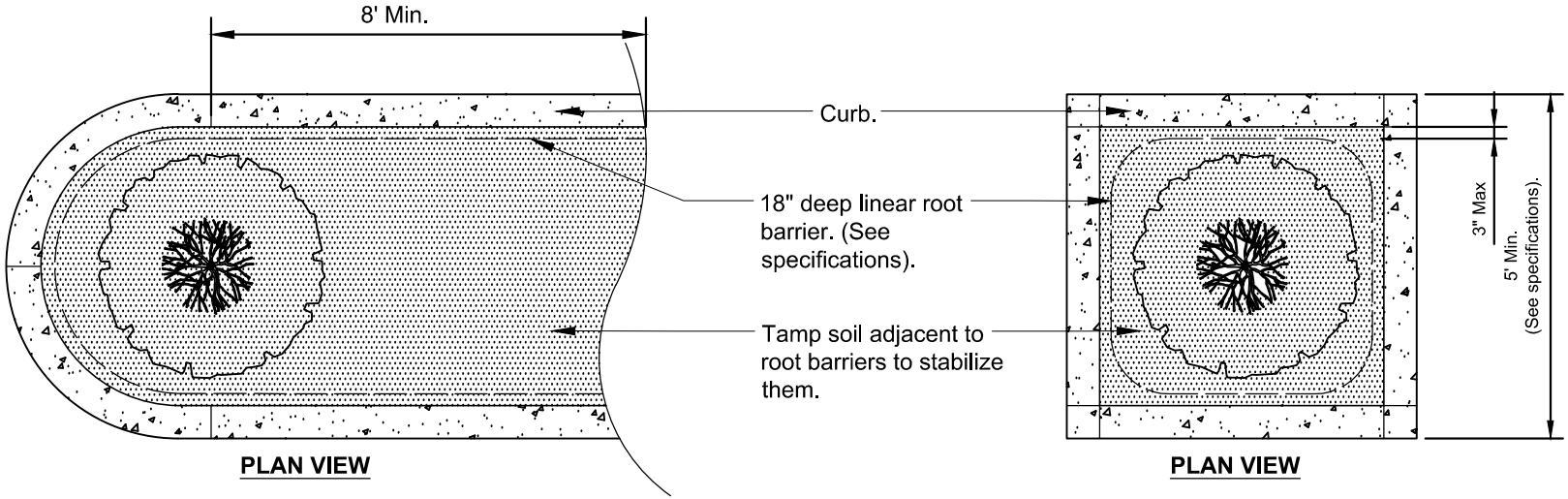
1- Root barriers shall be installed per manufacturer's specifications and recommendations.

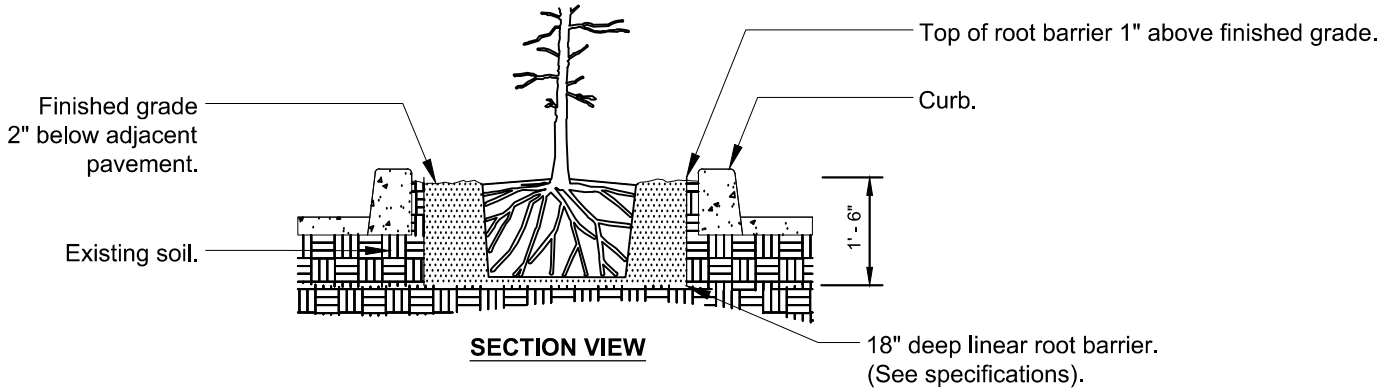
2- Root barriers shall be installed when root ball is located within 8' of pavement.

Notes:
1- See planting soil specifications for additional requirements.



RADIAL TRENCHING

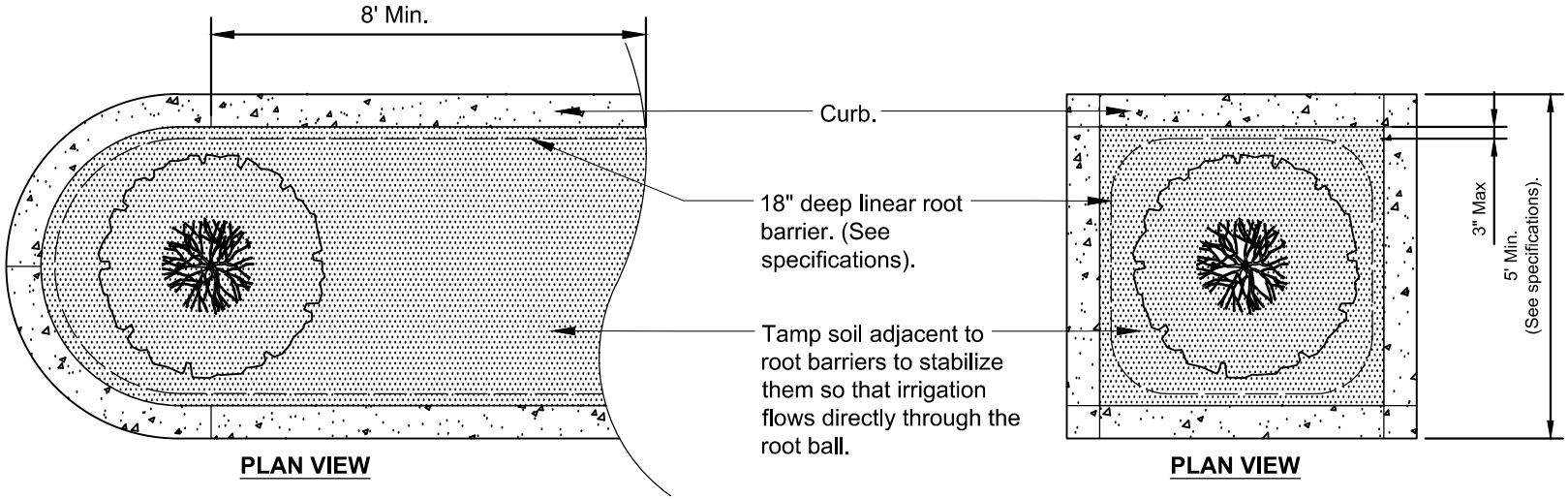


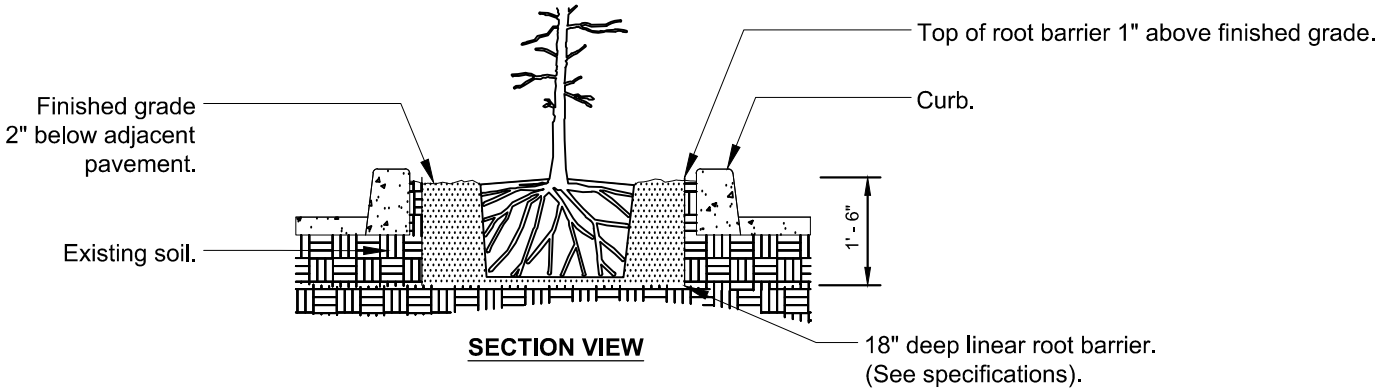


Notes:
1- Root barriers shall be installed per manufacturer's specifications and recommendations.

2- Root barriers shall be installed when root ball is located within 8' of pavement.

ROOT BARRIERS - PARKING LOT ISLANDS





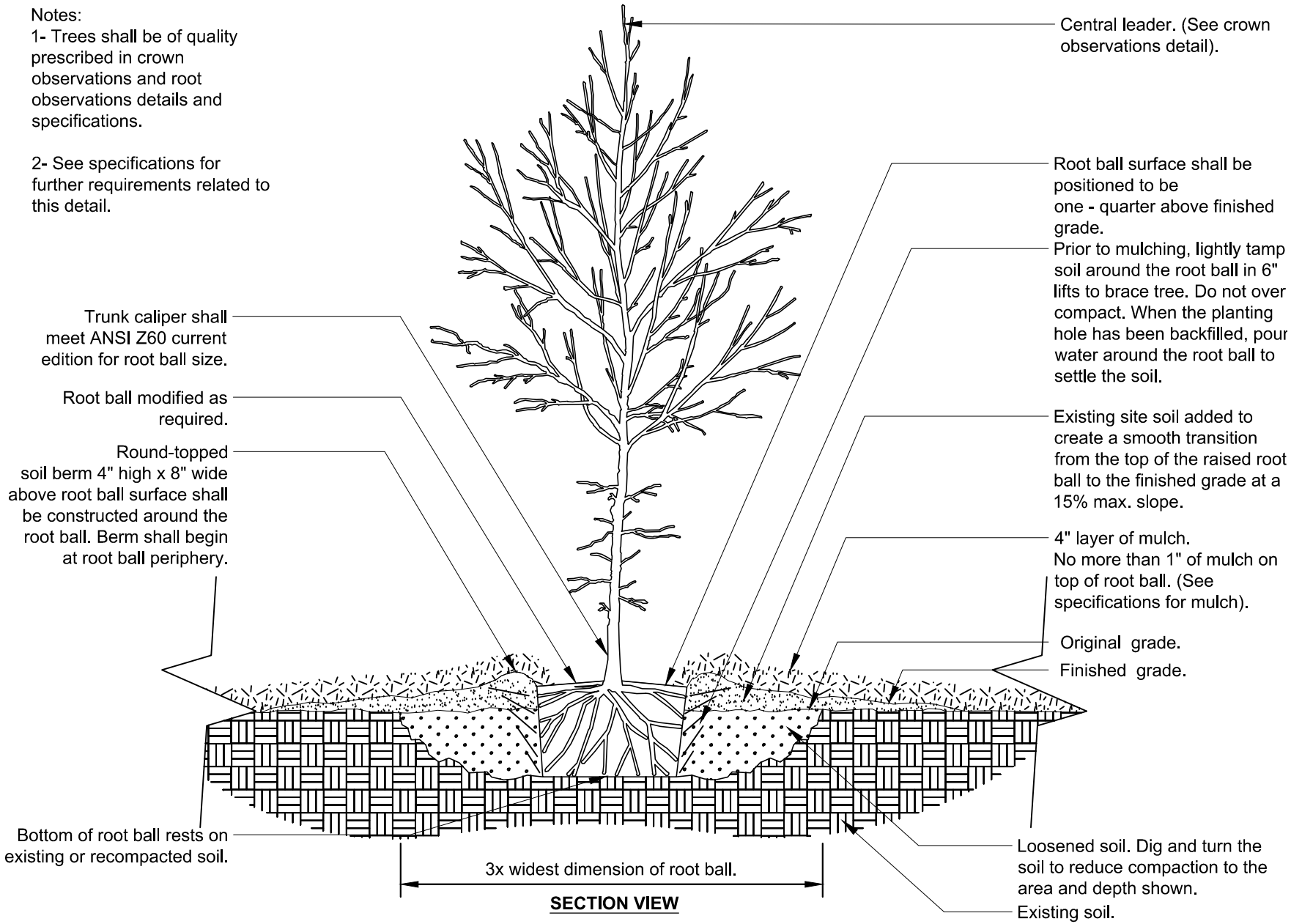
Notes:
1- Root barriers shall be installed per manufacturer's specifications and recommendations.

2- Root barriers shall be installed when root ball is located within 8' of pavement.

ROOT BARRIERS - PARKING LOT ISLANDS

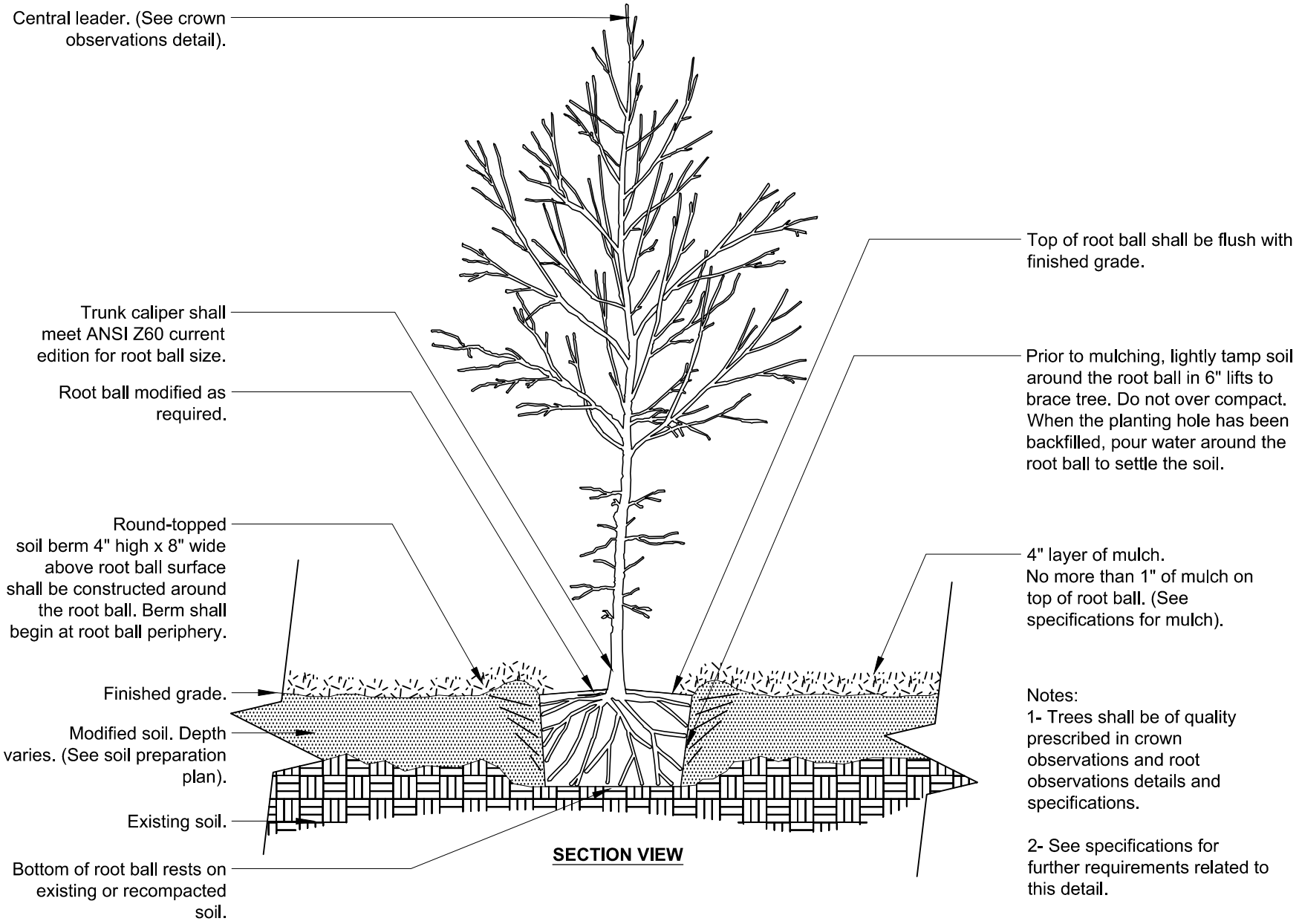
Notes:
1- Trees shall be of quality prescribed in crown observations and root observations details and specifications.

2- See specifications for further requirements related to this detail.

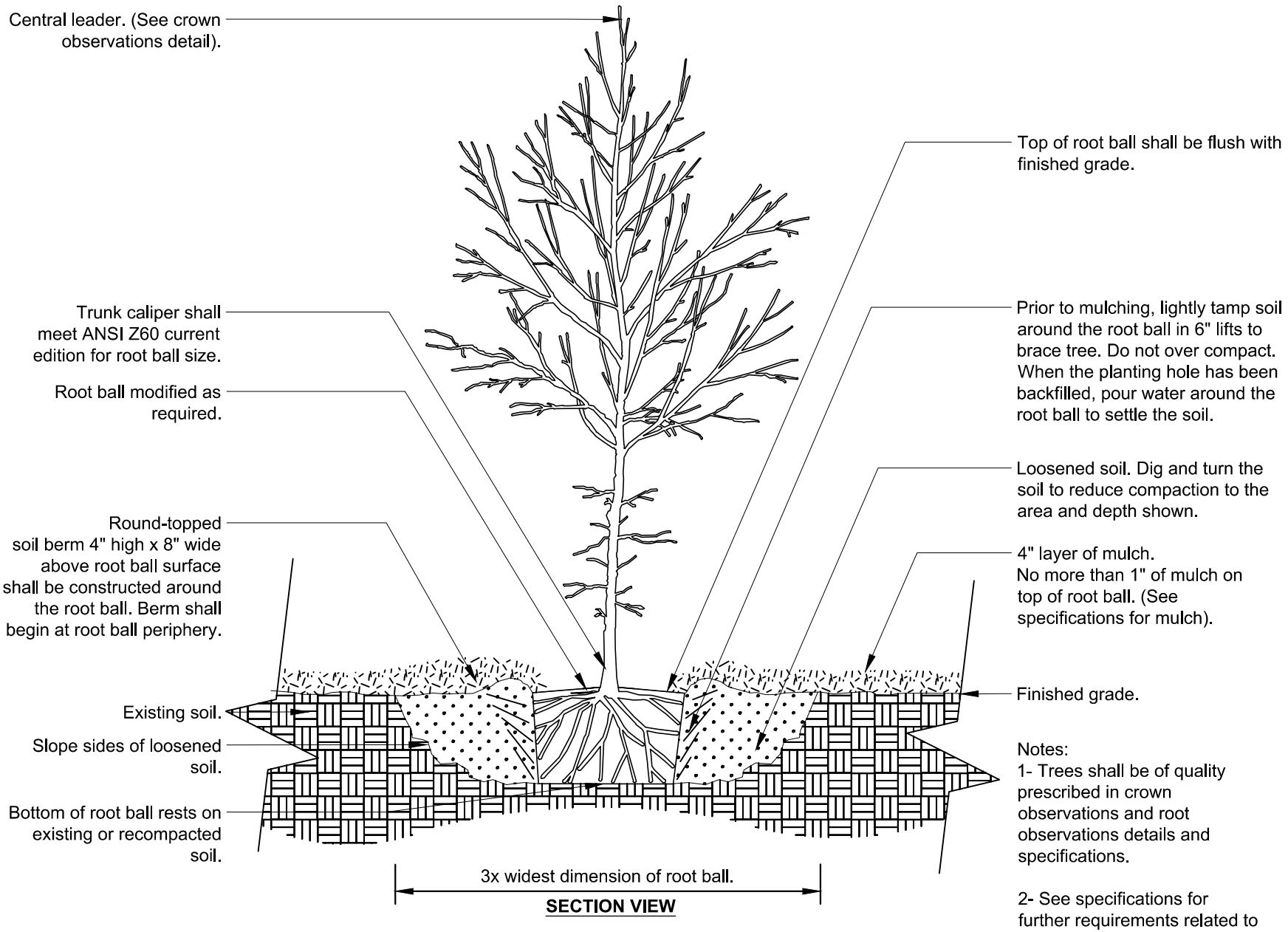


SECTION VIEW

TREE IN POORLY DRAINED SOIL



TREE w/ BERM (EXISTING SOIL MODIFIED)



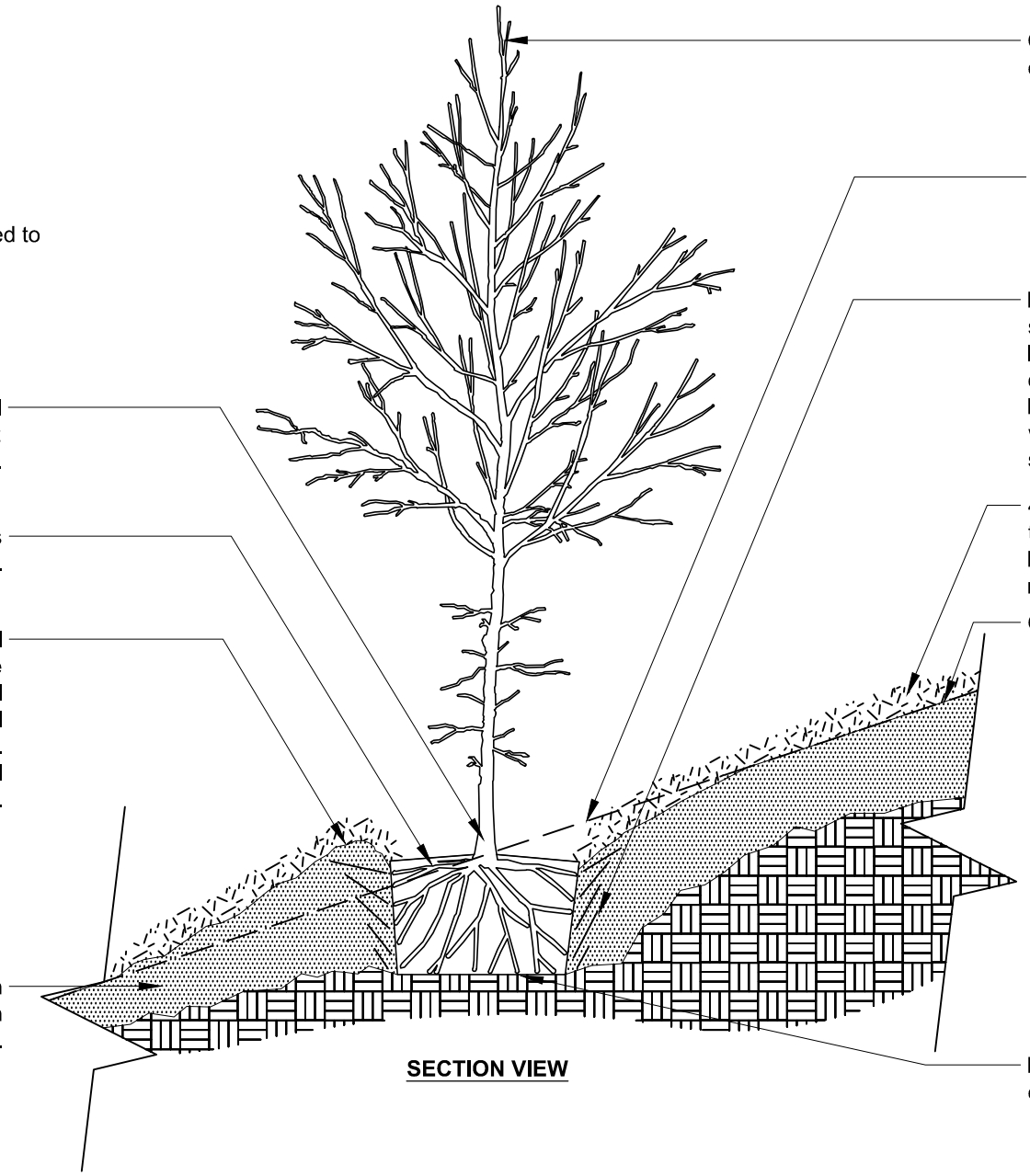
Notes:
1- Trees shall be of quality prescribed in crown observations and root observations details and specifications.

2- See specifications for further requirements related to this detail.

TREE w/ BERM (EXISTING SOIL NOT MODIFIED)

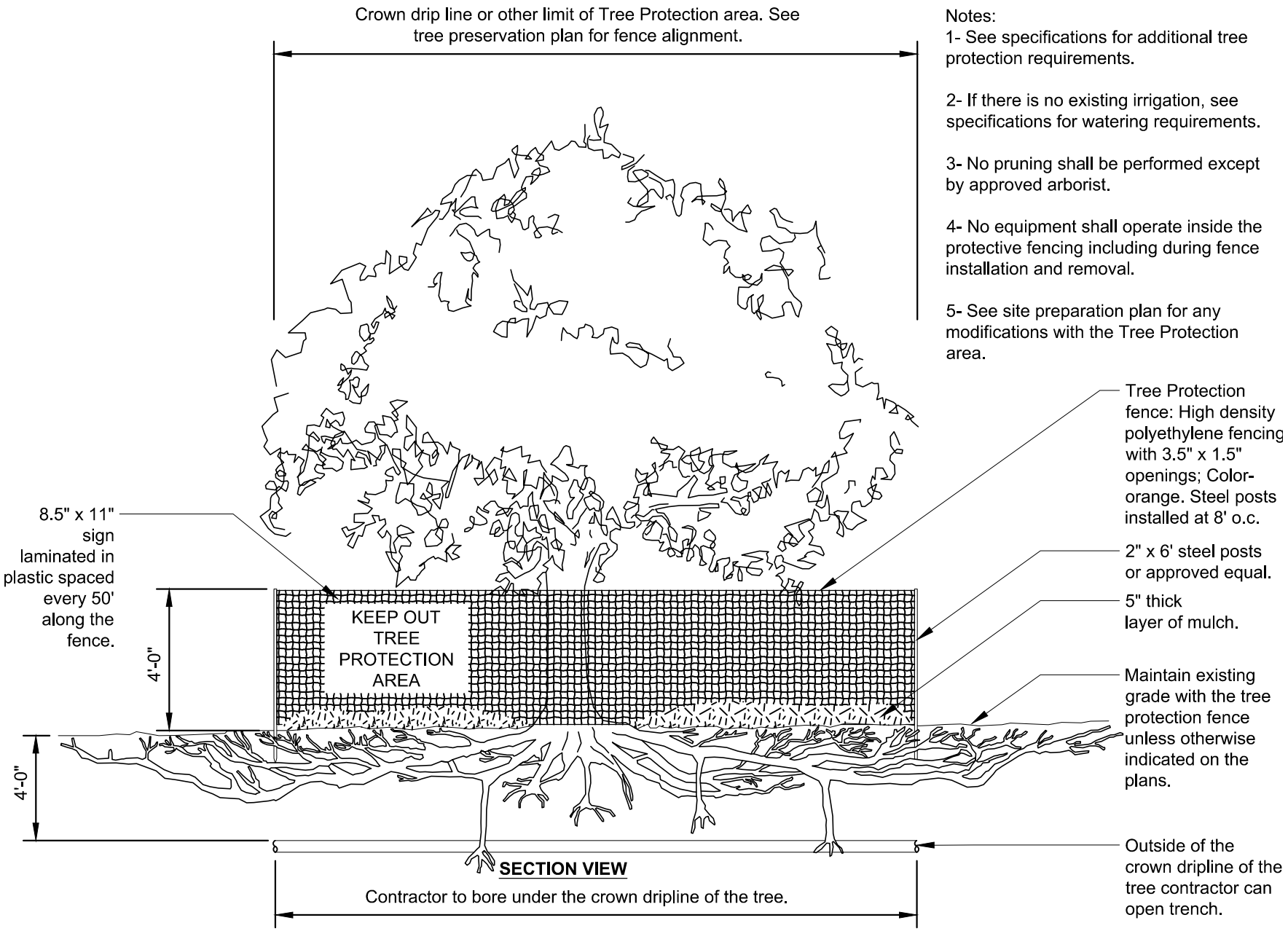
Notes:
1- Trees shall be of quality prescribed in crown observations and root observations details and specifications.

2- See specifications for further requirements related to this detail.

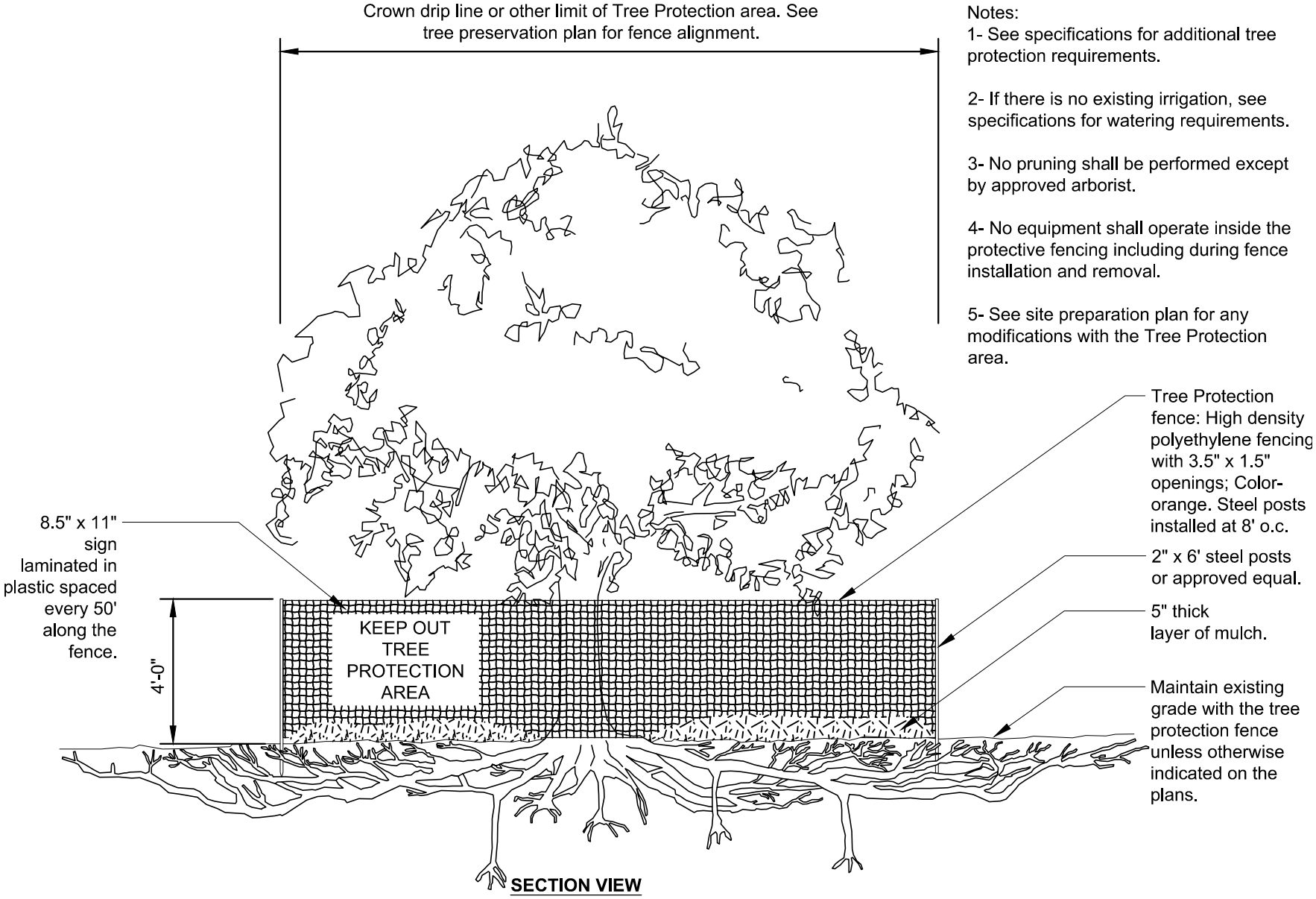


SECTION VIEW

TREE ON SLOPE 5% (20:1) TO 50% (2:1) (EXISTING SOIL MODIFIED)



TREE PROTECTION - BORING UNDER CROWN DRIPLINE



Notes:
1- See specifications for additional tree protection requirements.

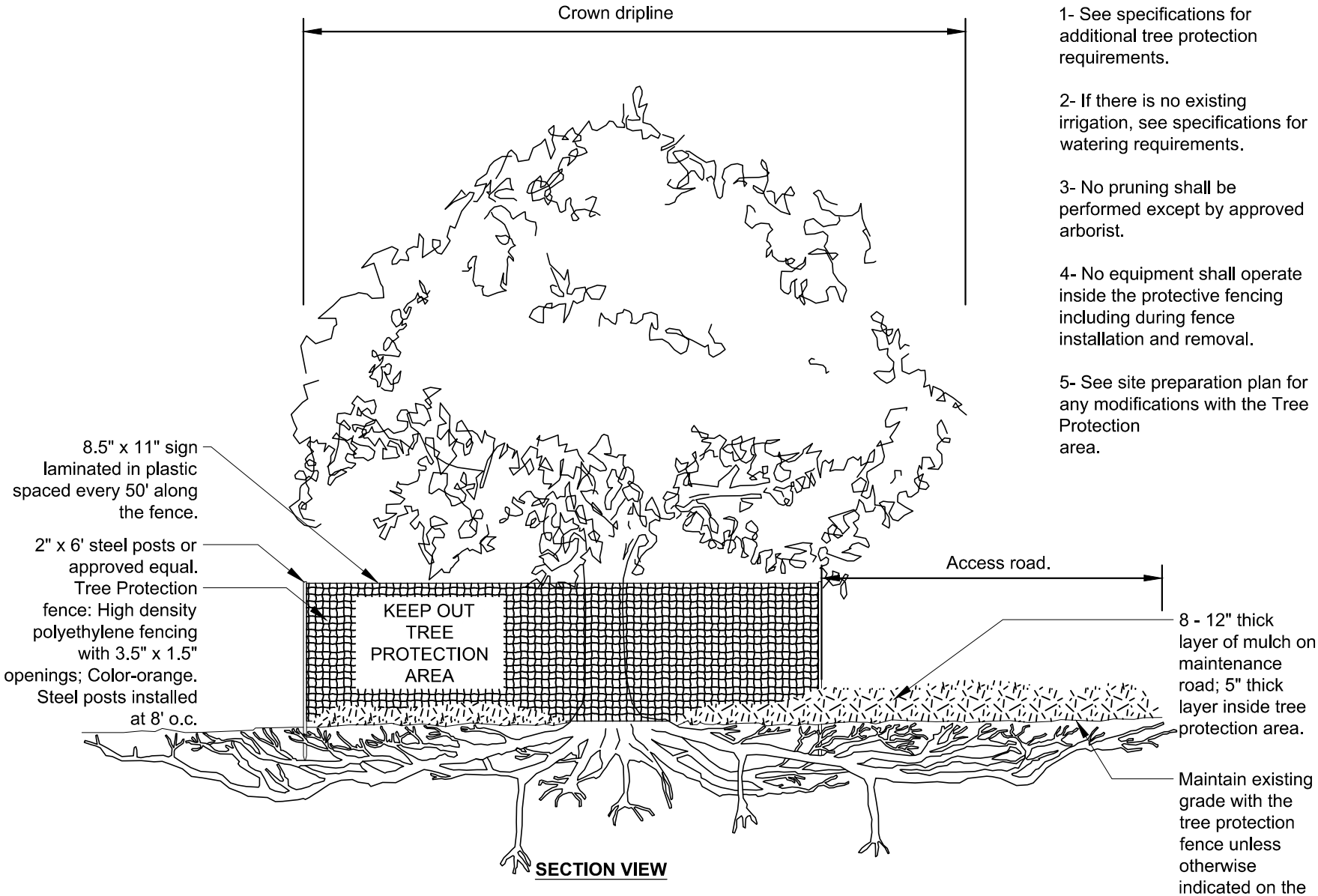
2- If there is no existing irrigation, see specifications for watering requirements.

3- No pruning shall be performed except by approved arborist.

4- No equipment shall operate inside the protective fencing including during fence installation and removal.

5- See site preparation plan for any modifications with the Tree Protection area.

TREE PROTECTION



Notes:
1- See specifications for additional tree protection requirements.

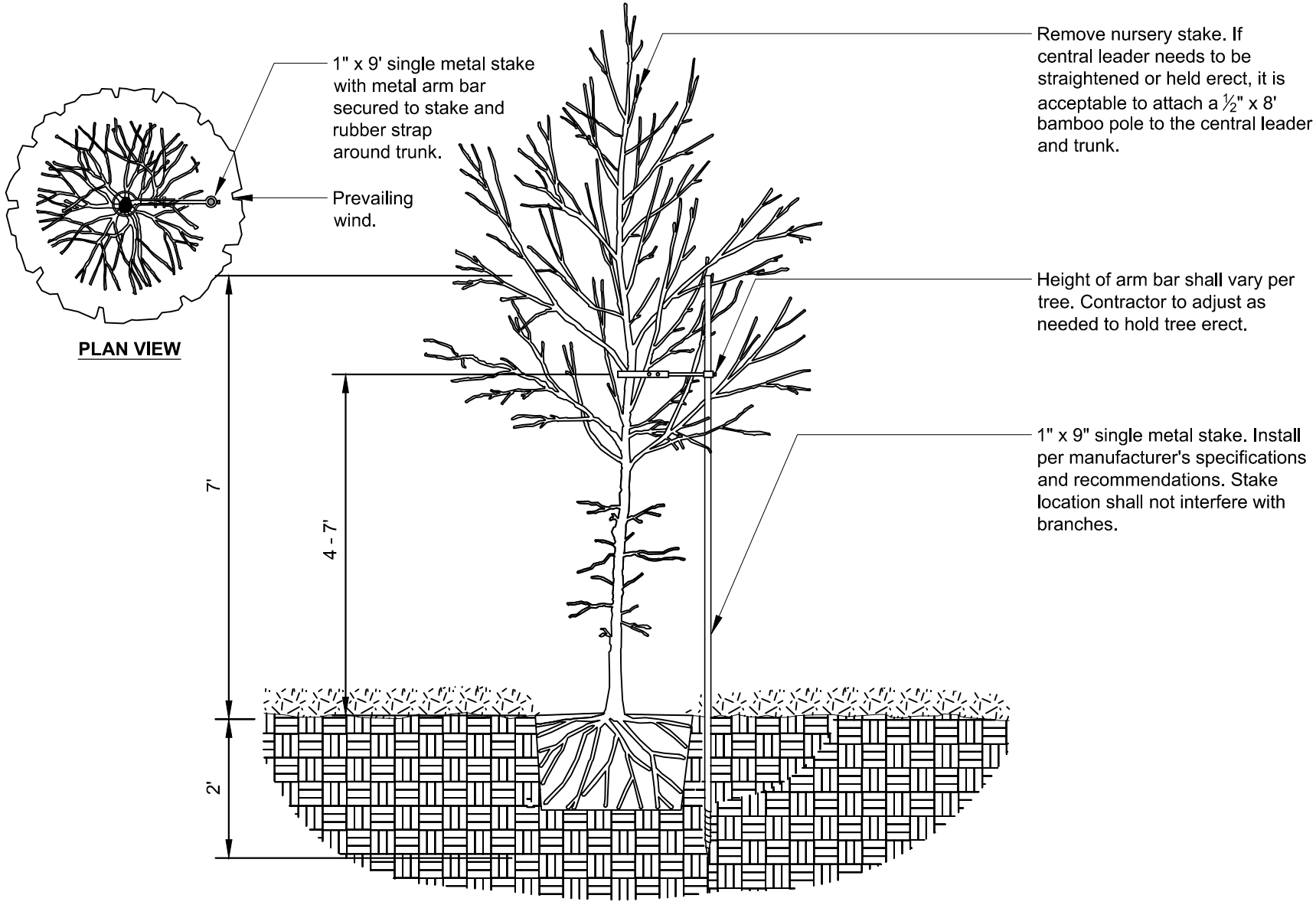
2- If there is no existing irrigation, see specifications for watering requirements.

3- No pruning shall be performed except by approved arborist.

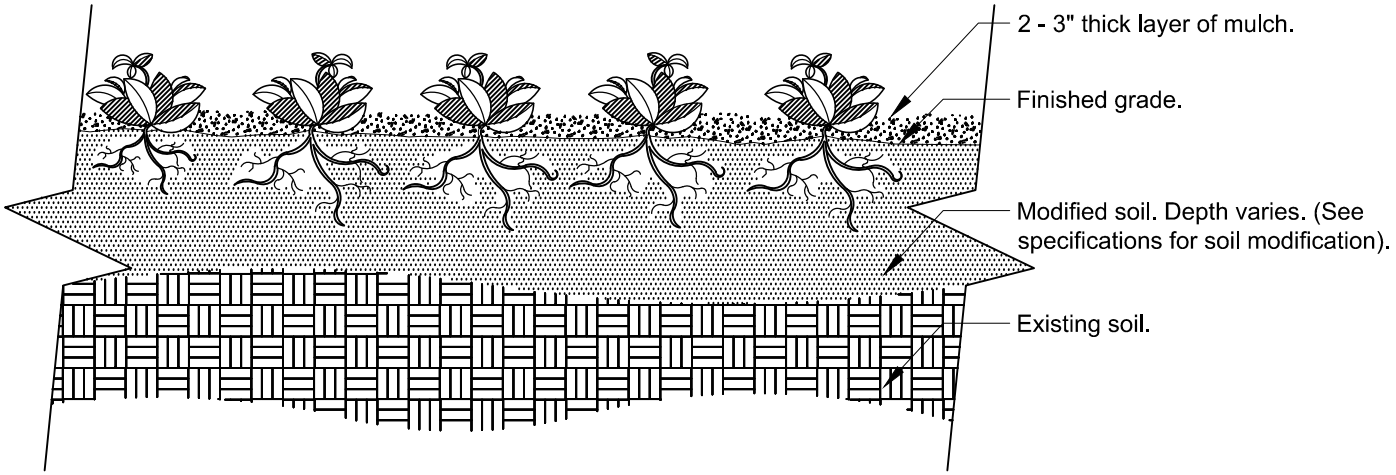
4- No equipment shall operate inside the protective fencing including during fence installation and removal.

5- See site preparation plan for any modifications with the Tree Protection
area.

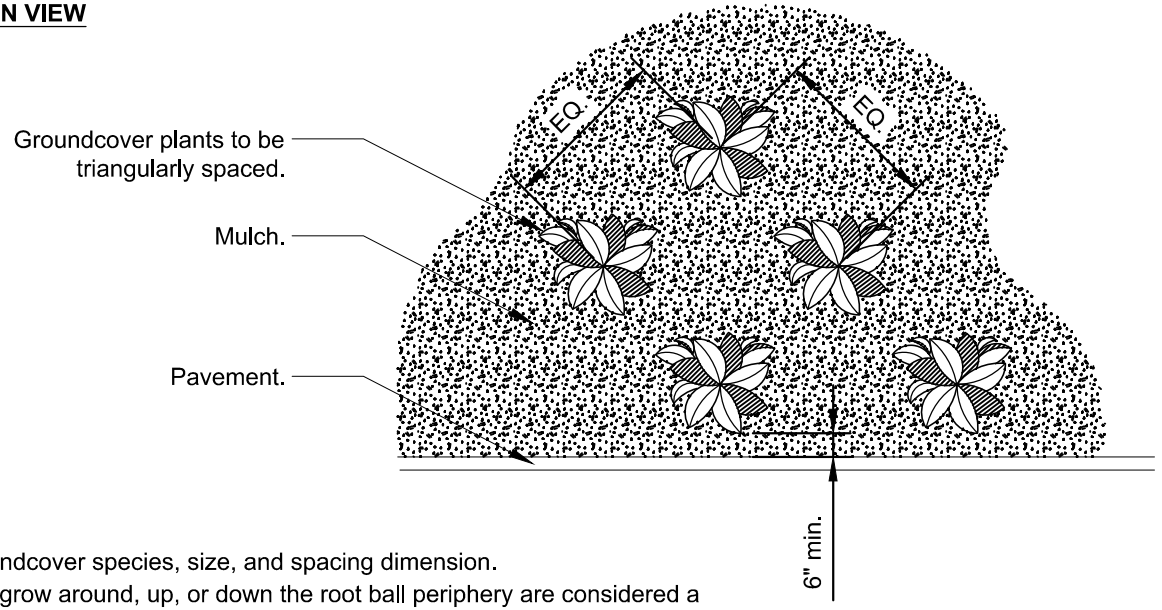
TREE PROTECTION - MAINTENANCE ROAD



TREE STAKING - SINGLE METAL STAKE



SECTION VIEW



PLAN

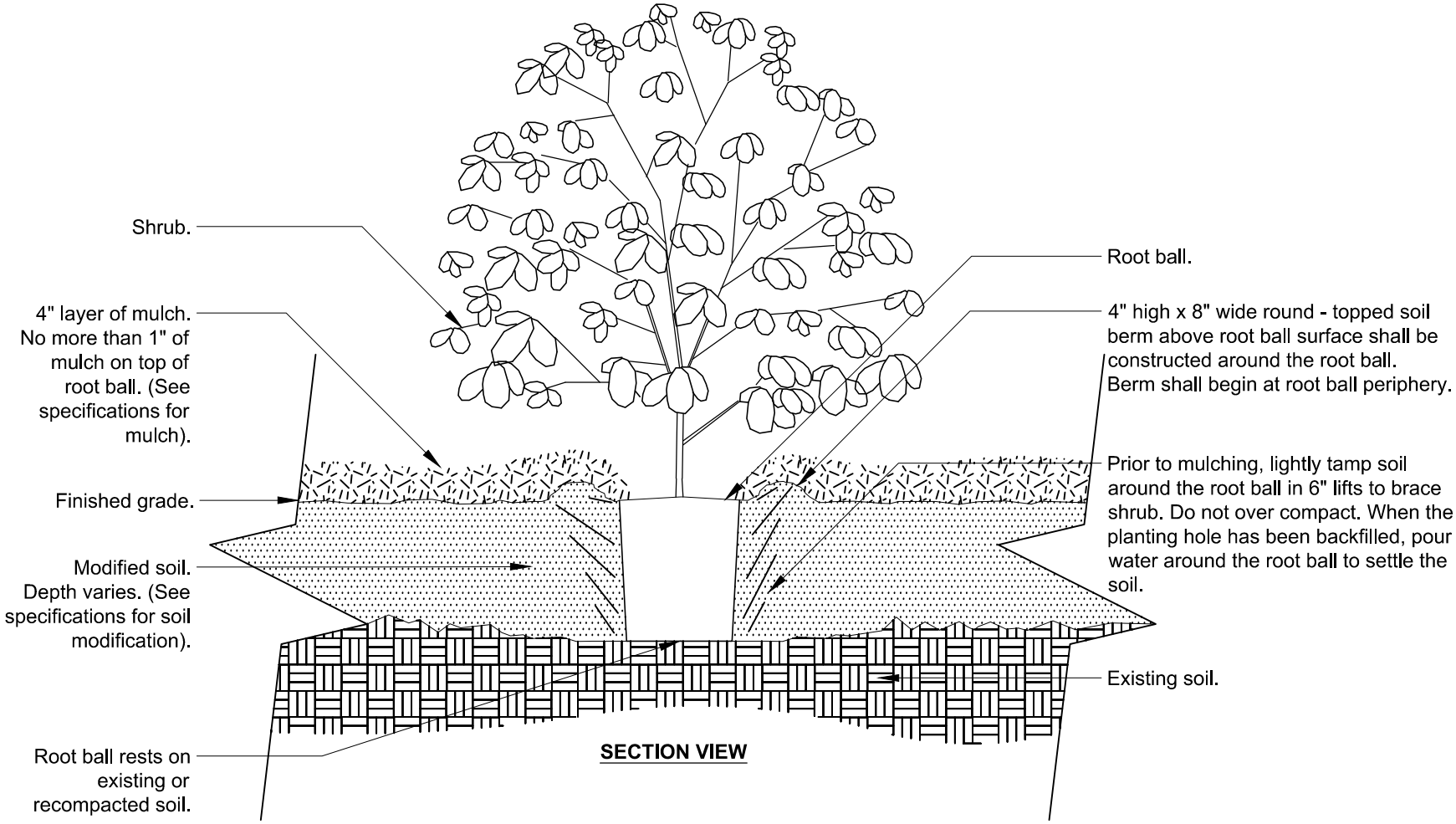
Notes:

1- See planting legend for groundcover species, size, and spacing dimension.

2- Small roots (¼" or less) that grow around, up, or down the root ball periphery are considered a normal condition in container production and are acceptable however they should be eliminated at the time of planting. Roots on the periperhy can be removed at the time of planting. (See root ball shaving container detail).

3- Settle soil around root ball of each groundcover prior to mulching.

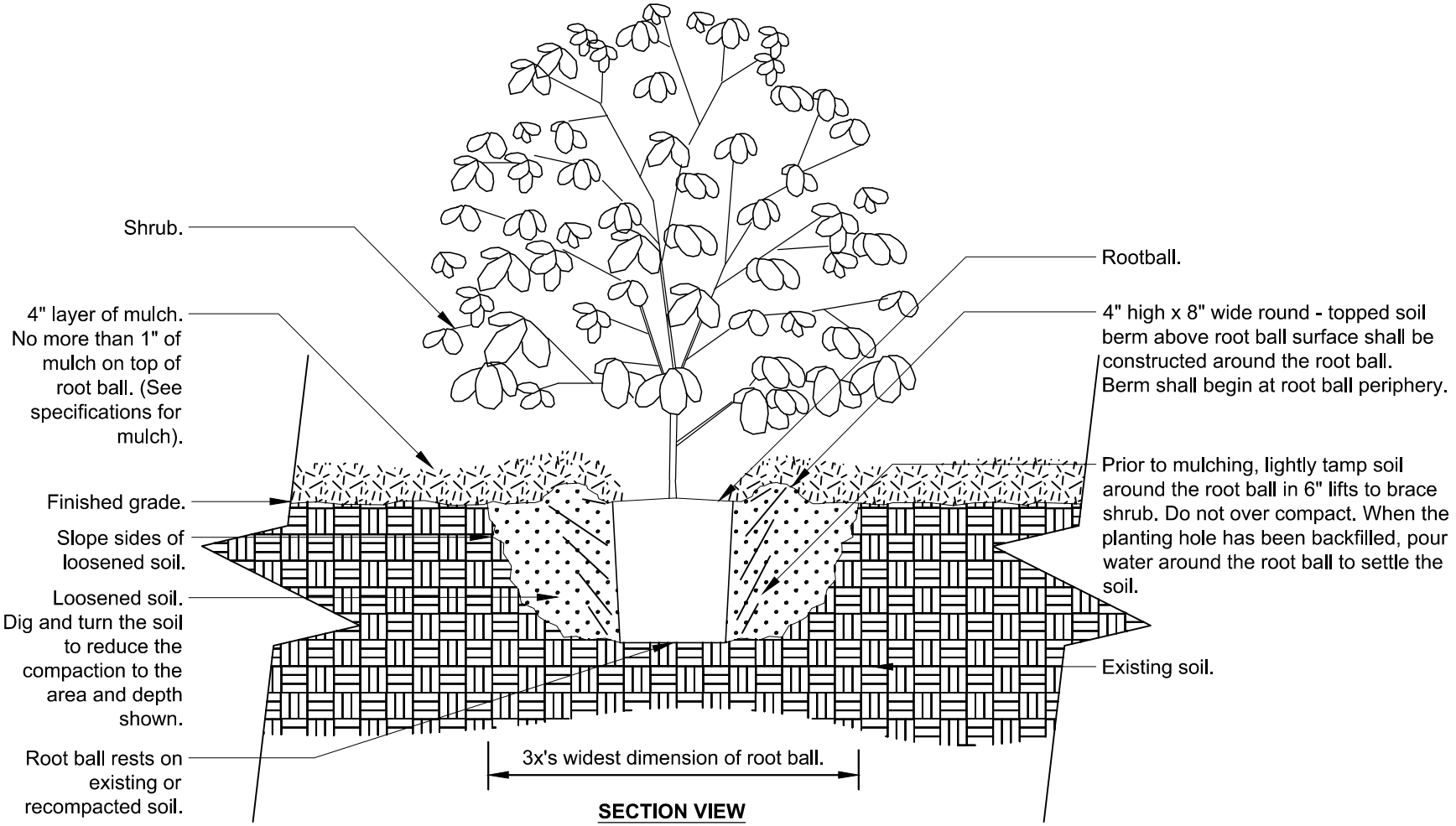
GROUNDCOVER



Notes:
1- Shrubs shall be of quality prescribed in the root observations detail and specifications.

2- See specifications for further requirements related to this detail.

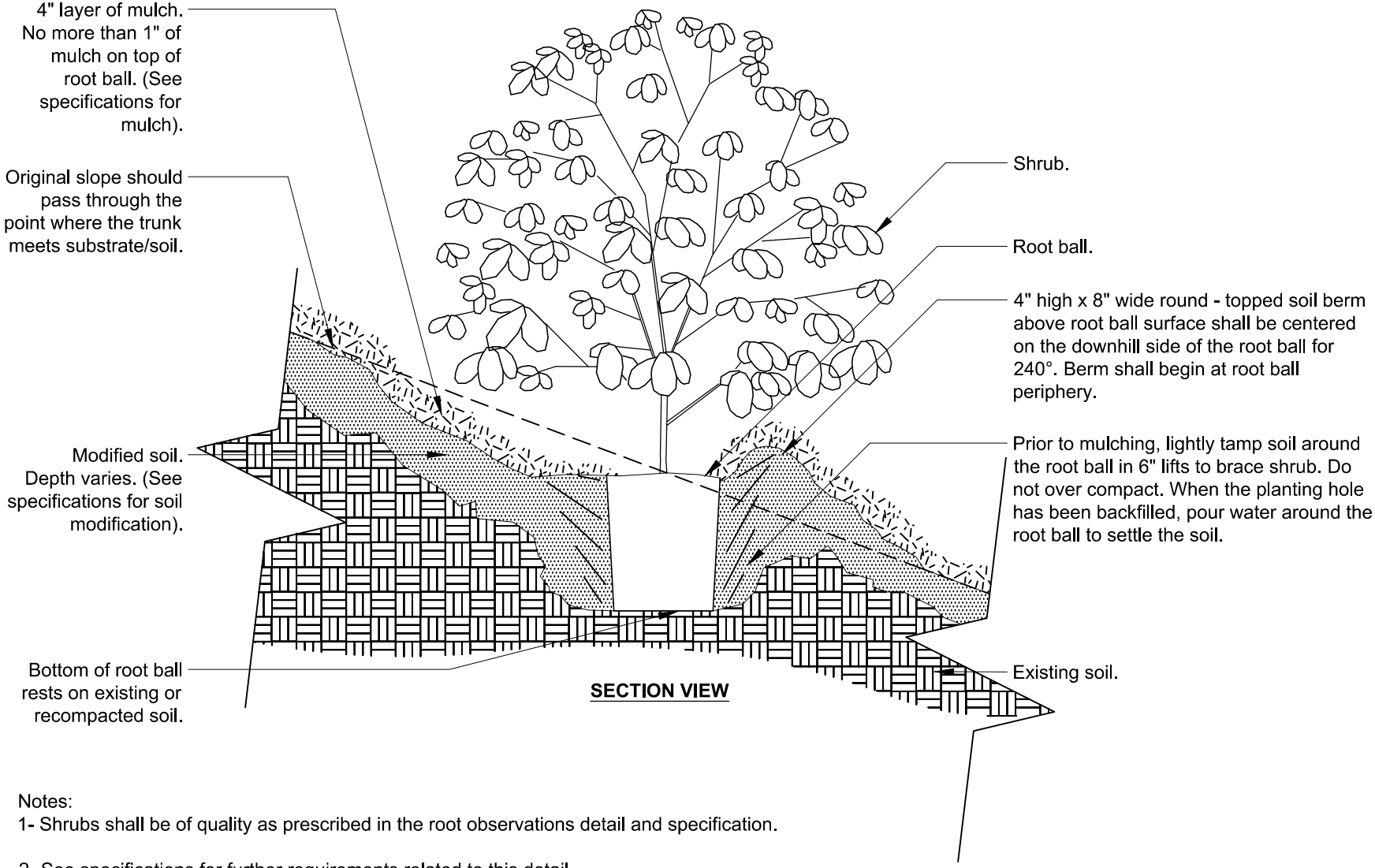
SHRUB - MODIFIED SOIL



Notes:
1- Shrubs shall be of quality prescribed in the root observations detail and specifications.

2- See specifications for further requirements related to this detail.

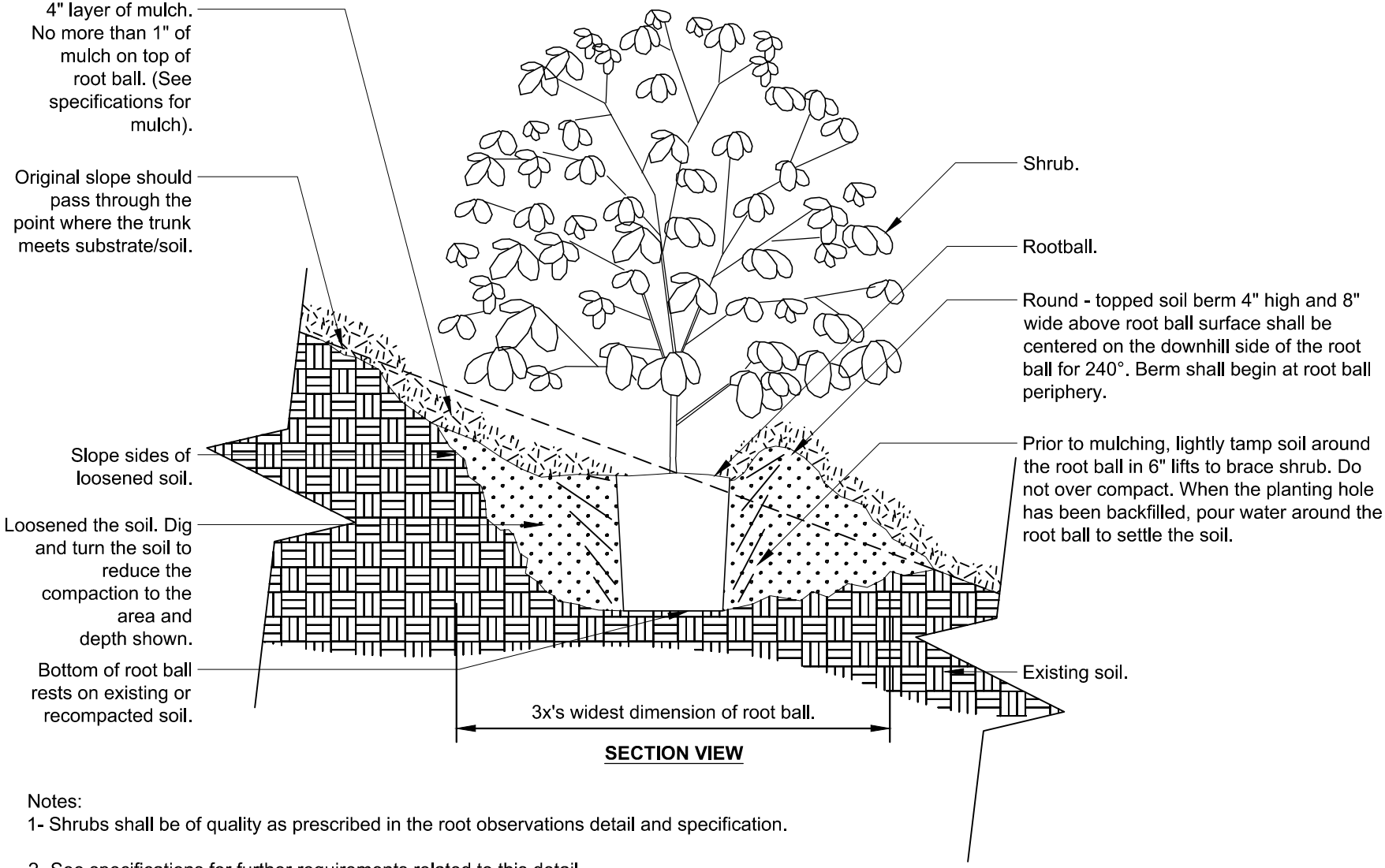
SHRUB - UNMODIFIED SOIL



Notes:
1- Shrubs shall be of quality as prescribed in the root observations detail and specification.

2- See specifications for further requirements related to this detail.

SHRUB ON SLOPE 5% (20:1) TO 50% (2:1) - MODIFIED SOIL



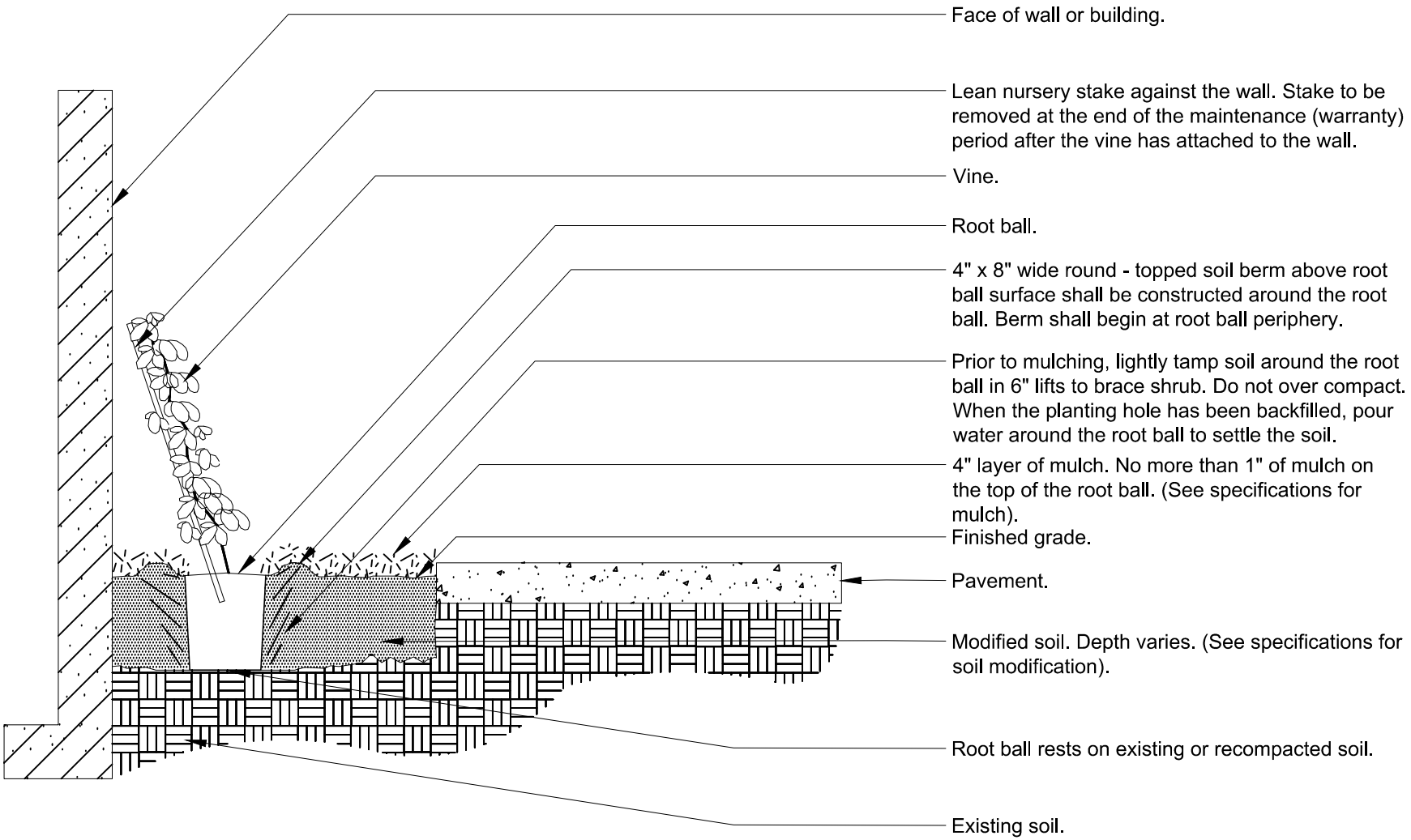
SECTION VIEW

Notes:

1- Shrubs shall be of quality as prescribed in the root observations detail and specification.

2- See specifications for further requirements related to this detail.

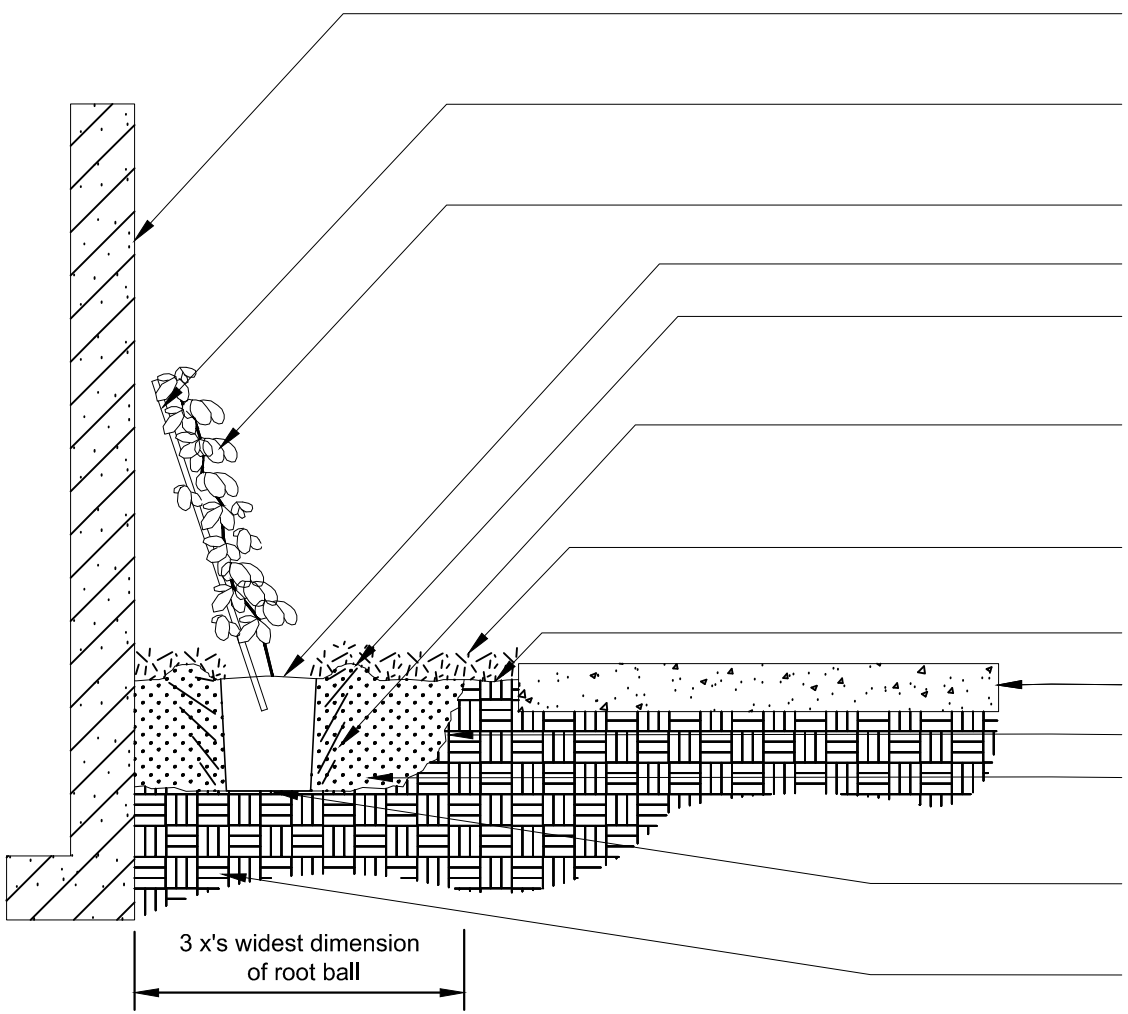
SHRUB ON SLOPE 5% (20:1) TO 50% (2:1) - UNMODIFIED SOIL



Notes:
1- Vines shall be of quality as prescribed in the root observations detail and specifications.

2- See specifications for further requirements related to this detail.

VINE - MODIFIED SOIL



Notes:
1- Vines shall be of quality as prescribed in the root observations detail and specifications.

2- See specifications for further requirements related to this detail.

VINE - UNMODIFIED SOIL